2/1

a) $16^{\frac{3}{4}}$

$= \sqrt[4]{16^3}$

$= 2^3 = 8$

b) $256^{0,375}$

$= 256^{\frac{375}{1000}}$

$= 256^{\frac{3}{8}}$

$= \sqrt[8]{2^{8 \cdot 3}}$

$= 2^3 = 8$

$\frac{375}{1000} = \frac{3}{8}$

$256 = 2^8$

c) $(\sqrt{2})^{-2}$

$= \left(\frac{1}{\sqrt{2}}\right)^2$

$= \frac{1}{2}$

d) $0,25^{2,5}$

$= \left(\frac{25}{100}\right)^{25/10}$

$= \left(\frac{1}{4}\right)^{5/2}$

$= \frac{1}{2^5} = \frac{1}{32}$

e) $(0,04)^{-1/2}$

$= \left(\frac{4}{100}\right)^{-1/2}$

$= (25)^{1/2}$

$= \sqrt{25} = 5$

f) $(0,2)^{-4}$

$= \left(\frac{2}{10}\right)^{-4}$

$= 5^4$

$= 625$

g) $\sqrt[3]{32}^{\,-\frac{6}{5}}$

$= 32^{\frac{1}{3} \cdot -\frac{6}{5}} = 32^{-\frac{6}{15}} = 32^{-\frac{2}{5}}$

$= \frac{1}{\sqrt[5]{32^2}} = \frac{1}{2^2} = \frac{1}{4}$

2/2

$$a^m \cdot a^n = a^{m+n}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

a) $$\frac{a^{-\frac{1}{2}} \cdot a^{\frac{2}{3}}}{a^{\frac{1}{6}}} = \frac{a^{-\frac{1}{2}+\frac{2}{3}}}{a^{\frac{1}{6}}}$$

$$= \frac{a^{\frac{1}{6}}}{a^{\frac{1}{6}}} = a^0 = 1$$

b) $$\frac{(ab^2c)^{-2}\,(a^{-1}b^{-4})^{-3}}{abc^{-6}\,(b^2c)^2}$$

$$\Rightarrow \frac{a^{-2}\cdot b^{-4}\cdot c^{-2}\cdot a^{3}\cdot b^{12}}{abc^{-6}\cdot b^{4}\cdot c^{2}} = \frac{\cancel{a^{1}}\cdot b^{8}\cdot c^{-2}}{\cancel{a^{1}}\cdot b^{5}\cdot c^{-4}}$$

$$\Rightarrow b^{8-5}\cdot c^{-2+4} = b^3\cdot c^2$$

c) $$\frac{2^{2+\sqrt{8}}\cdot 16^{-0,5}}{0,125^{-2}\cdot 4^{\sqrt{2}-4}} = \frac{2^{2+\sqrt{8}}\cdot 2^{-\frac{4}{2}}}{\left(\frac{1000}{125}\right)^{2}\cdot 2^{2\sqrt{2}-8}} = \frac{2^{2+\sqrt{8}}\cdot 2^{-2}}{2^{6}\cdot 2^{2\sqrt{2}-8}}$$

$$\Rightarrow 2^{\cancel{2}+\cancel{2\sqrt{2}}\cancel{-2}-6-\cancel{2\sqrt{2}}+8}$$

$$\Rightarrow 2^2 = 4$$

2/3 Als $f(x) = 2^x$, bewijs dat $f(x+3) - f(x-1) = \frac{15}{2} f(x)$

$f(x+3) = 2^{x+3} = 2^x \cdot 2^3$
$f(x-1) = 2^{x-1} = 2^x \cdot 2^{-1}$
$f(x) = 2^x$

$f(x+3) - f(x-1)$
$= (2^x \cdot 2^3) - (2^x \cdot 2^{-1})$
$= 2^x (2^3 - 2^{-1})$
$= 2^x (8 - \frac{1}{2})$
$= 2^x (\frac{16}{2} - \frac{1}{2}) = 2^x \cdot \frac{15}{2} = f(x) \cdot \frac{15}{2}$

2/4 Als $f(x) = 2^x$, bewijs dat $\frac{f(x+3)}{f(x-1)} = f(4)$

$f(x+3) = 2^{x+3}$
$f(x-1) = 2^{x-1}$
$f(4) = 2^4 = 16$

$\frac{f(x+3)}{f(x-1)} = \frac{2^{x+3}}{2^{x-1}} = 2^{x+3-x+1}$
$= 2^4$
$= 16 = f(4)$

2/6

a) $27^{x-1} = 9$

$3^{3x-3} = 3^2$

$3x-3 = 2$

$3x = 5$

$x = \frac{5}{3}$

b) $6 \cdot \sqrt{0{,}1^x} = 10^{x+1} \cdot \sqrt{36}$

$\Rightarrow \cancel{6} \cdot 10^{-\frac{x}{2}} = 10^{x+1} \cdot \cancel{6} \cdot 10^{-\frac{1}{2}}$

$\Rightarrow 10^{-\frac{x}{2}} = 10^{x+1} \cdot 10^{-\frac{1}{2}}$

$\Rightarrow -\frac{x}{2} = x+1-\frac{1}{2}$

$\Rightarrow \frac{x}{2} + x = \frac{1}{2} - 1$

$\Rightarrow x\left(\frac{1}{2}+1\right) = -\frac{1}{2}$

$\Rightarrow x = \frac{-\frac{1}{2}}{\frac{3}{2}} = -\frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{3} = -\frac{1}{3}$

c) $x^2 \cdot e^x - 3e^x = 0$

$x^2 \cancel{e^x} = 3\cancel{e^x}$

$x^2 = 3$

$x = \sqrt{3}$

d) $3^{x+1} - 3^{x-1} = 8$

$3^{x+1} - 3^{x-1} = 3^2 - 3^0$

$x\cancel{+1} + x \cancel{-1} = 2 - 0$

$2x = 2$

$x = 1$

2/6

e) $8^{x} + 4^{x} = 5 \cdot 2^{x-4}$

$2^{3x} + 2^{2x} = 5 \cdot 2^{x} \cdot 2^{-4}$ Stel $2^{x} = t$

$t^{3} + t^{2} - \frac{5}{16} t$

$t(t^{2} + t - \frac{5}{16})$

$D = b^{2} - 4ac$

$= 1^{2} - 4 \cdot 1 \cdot -\frac{5}{16} = 1 + \frac{5}{4} = \frac{9}{4}$

$t_1 = \frac{-b + \sqrt{D}}{2a} = \frac{-1 + \frac{3}{2}}{2} = \frac{1}{4} = 2^{x}$

$= 2^{-2}$

$2^{x} = \frac{1}{4} = 2^{-2}$

$x = -2$

f) $12 \cdot 2^{2x-1} - 4^{x+1} = 4$

$12 \cdot 2^{2x-1} - 2^{2x+2} = 2^{2}$

$12 \cdot 2^{2x} \cdot 2^{-1} - 2^{2x} \cdot 2^{2} = 2^{2}$

$6 \cdot 2^{2x} - 2^{2x} \cdot 2^{2} = 2^{2}$

$2^{2x}(6-4) = 4$

$2^{2x} = \frac{4}{2} = 2$

$2^{2x} = 2^{1}$

$2x = 1$

$x = \frac{1}{2}$

g) $e^{x} + e^{-x} = 2$ => Vermenigvuldigen alles met e^{x}

$e^{x} \cdot e^{x} + e^{-x} e^{x} = 2 \cdot e^{x}$

$x + x + (-x) + x = x$

$2x = x$

$x => 0$

h) $e^{x} = -e^{-2x}$

$x = -2x$ => $x = 0$

Als we $x = 0$ invullen in oorspronkelijke formule

↳ $e^{0} = -e^{-2 \cdot 0}$ => $1 = -1$ => kan niet!

2/6

i) $4^{2x} - 4^{\frac{3}{2}} = 7 \cdot 4^{x}$ $\Rightarrow$ stel $4^{x} = t$

$t^2 - 7t - 8$

$D = b^2 - 4ac$
$= 49 - (-32)$
$= 81$

$t_1 = \frac{-b+\sqrt{D}}{2a} = \frac{7+9}{2} = 8 = 2^3$

$t = 4^x = 2^{2x}$

$2^{2x} = 2^3$

$2x = 3$

$x = \frac{3}{2}$

j) $10^{x^2-2x+1} = 0$

$\Rightarrow$ kan niet want 10^x kan nooit 0 zijn

k) $27^{\frac{1}{x}} \cdot 243^{\frac{1}{x+2}} = 81^{\frac{1}{x-1}}$

$3^{\frac{3}{x}} \cdot 3^{\frac{5}{x+2}} = 3^{\frac{4}{x-1}}$

$\frac{3}{x} + \frac{5}{x+2} = \frac{4}{x-1}$

$3(x+2)(x-1) + 5x(x-1) - 4x(x+2) = 0$

$3x^2 + 6x - 3x - 6 + 5x^2 - 5x - 4x^2 - 8x = 0$

$4x^2 - 10x - 6 = 0$

$2x^2 - 5x - 3 = 0$

$D = b^2 - 4ac$
$= 25 + 24$
$= 49$

$x_1 = \frac{-b+\sqrt{D}}{2a} = \frac{5+7}{4} = \frac{12}{4} = 3$

$x_2 = \frac{-b-\sqrt{D}}{2a} = \frac{5-7}{4} = \frac{-2}{4} = -\frac{1}{2}$

3/1

a) $\log_2 16 = x$

$2^x = 16$

$x = 4$

b) $\log_2 \sqrt{2} = x$

$2^x = \sqrt{2}$

$x = \frac{1}{2}$

c) $\log_2 \frac{1}{4} = x$

$2^x = \frac{1}{4}$

$x = -2$

d) $\log_2 \sqrt[3]{4} = x$

$2^x = \sqrt[3]{4}$

$2^x = 4^{\frac{1}{3}} = 2^{\frac{2}{3}}$

$2^x = 2^{\frac{2}{3}}$

$x = \frac{2}{3}$

e) $\log_2 \frac{1}{\sqrt[5]{16}} = x$

$2^x = \frac{1}{\sqrt[5]{16}}$ $\qquad$ $\frac{1}{\sqrt[5]{16}} = 2^{-\frac{4}{5}}$

$2^x = 2^{-\frac{4}{5}}$

$x = -\frac{4}{5}$

f) $\log_3 81 = x$

$3^x = 81$ $\qquad$ $81 = 3^4$

$3^x = 3^4$

$x = 3$

g) $\log_3 \sqrt[6]{27} = x$ $\qquad$ $27 = 3^3$

$3^x = 3^{\frac{3}{6}}$

$x = \frac{3}{6} = \frac{1}{3}$

3/1

h) $\log_3 243 = x$ $243 = 3^5$

$3^x = 243$

$3^x = 3^5$

$x = 5$

i) $\log_3 1 = x$

$3^x = 1$

$x = 0$

j) $\log_3 \frac{1}{\sqrt{3}} = x$ $\frac{1}{\sqrt{3}} = 3^{-\frac{1}{2}}$

$3^x = \frac{1}{\sqrt{3}}$

$3^x = 3^{-\frac{1}{2}}$

$x = -\frac{1}{2}$

k) $\log_{0,5} 8 = x$

$0,5^x = 8$

$\left(\frac{1}{2}\right)^x = 2^3$

$x = -3$

l) $\log_8 2 = x$

$8^x = 2$

$x = \frac{1}{3}$

m) $\log_{0,25} \frac{1}{2} = x$ $\frac{25}{100} = \frac{1}{4}$

$\left(\frac{25}{100}\right)^x = \frac{1}{2}$

$\left(\frac{1}{4}\right)^x = \frac{1}{2}$

$x = \frac{1}{2}$

3/1

n) $\log_5 125 = x$

$5^x = 125$

$x = 3$

o) $\log_{0,1} 100 = x$ $\qquad 0,1 = \frac{1}{10}$

$0,1^x = 100$

$\left(\frac{1}{10}\right)^x = 100$

$x = -2$

p) $\ln\sqrt{e} = x$

$\ln e^x = x$

$\hookrightarrow \ln e^{\frac{1}{2}} = \cancel{\tfrac{1}{2}}\, x$

$x = \frac{1}{2}$

q) $\ln \frac{1}{e} = x$

$\ln e^x = x$

$\hookrightarrow \ln e^{-1} = x$

$x = -1$

r) $\ln e^e = x$

$\ln e^x = x$

$\hookrightarrow \ln e^e = x$

$x = e$

s) $\ln \sqrt[e]{e} = x$

$\ln e^x = x$

$\hookrightarrow \ln \sqrt[e]{e} = x = \ln e^{\frac{1}{e}} = x$

$x = \frac{1}{e}$

t) $\ln \frac{1}{\sqrt{e^3}} = x$ $\qquad \frac{1}{\sqrt{e^3}} = e^{\frac{-3}{2}}$

$\ln e^x = x$

$\hookrightarrow \ln \frac{1}{\sqrt{e^3}} = x = \ln e^{\frac{-3}{2}} = x$

$x = \frac{-3}{2}$

3/2

a) $\log e \cdot \ln 10$

$\hookrightarrow 1 \quad \hookrightarrow 1$

$\Rightarrow 1 \cdot 1 = 1$

b) $2^{\log_4 8}$

$\log_4 8 = x \quad = \log_4 2^3 = x$

$\hookrightarrow 3 \log_4 2 = x$

$3 \cdot \frac{1}{2} = \frac{3}{2}$

$\log_4 2 = x \Rightarrow 4^x = 2$

$x = \frac{1}{2}$

$2^{\log_4 8} = 2^{\frac{3}{2}}$

$= \sqrt{2^3} = 2\sqrt{2}$

c) $\log_4 16 \cdot \log_4 2$

$\Rightarrow \log_4 16 = x$

$4^x = 16 \Rightarrow x = 2$

$\Rightarrow \log_4 2 = x$

$4^x = 2 \Rightarrow x = \frac{1}{2}$

$\Rightarrow \log_4 16 \cdot \log_4 2$

$= 2 \cdot \frac{1}{2} = \frac{2}{2} = 1$

d) $2\log_3 12 - 4\log_3 6$

$\log_3 12^2 - \log_3 6^4$

$\log_3 \frac{144}{1296} = \log_3 \frac{72}{648} = \log_3 \frac{36}{324} = \log_3 \frac{18}{162} = \log_3 \frac{9}{81} = \log_3 \frac{1}{9} = x$

$\log_3 \frac{1}{9} = x$

$3^x = \frac{1}{9}$

$x = -2$

3/3 a) $10^{-1\log\frac{1}{x}}$ $\qquad a^{\log_a x} = x$

b) $x^{\frac{1}{\log_a x}}$ $\qquad \frac{1}{\log_a x} = \log_x a$

↳ $x^{\log_x a} = a$

c) $\log_{\frac{1}{3}} 3^{2x}$ $\qquad \log_a a^x = x$

↳ $\log_{3^{-1}} 3^{2x} = x$

↳ $x = -2x$

d) $3\log_a 2 + \log_a 40 - \log_a 16$

$\Rightarrow \log_a 8 + \log_a \frac{40}{16}$ $\qquad \log_a \frac{40}{16} = \log_a \frac{5}{2}$

$\Rightarrow \log_a 8 + \log_a \frac{5}{2}$

$\Rightarrow \log_a 8 \cdot \frac{5}{2} = \log_a \frac{40}{2} = \log_a 20$

e) $\log_\pi (1-\cos x) + \log_\pi (1+\cos x) - 2\log_\pi \sin x$

$\Rightarrow \log_\pi ((1-\cos x)(1+\cos x)) - \log_\pi \sin^2 x$

$\Rightarrow \log_\pi (1+\cos x - \cos x - \cos^2 x) - \log_\pi \sin^2 x$

$\Rightarrow \log_\pi \frac{1-\cos^2 x}{\sin^2 x} = \log_\pi \frac{\sin^2 x}{\sin^2 x} = \log_\pi 1 = x$

$\pi^x = 1 \Rightarrow x = 0$

3/4 $\log_a 1024 = 2 + \log_a 64$

$\log_a 1024 - \log_a 64 = 2$ $\qquad \log_a \frac{1024}{64} = \log_a \frac{512}{32} = \log_a \frac{128}{8}$

$\log_a \frac{1024}{64} = 2$

$= \log_a 16$

$\log_a 16 = 2$

$a^2 = 16$

$a = \sqrt{16}$

$a = 4$

3/5 a) $\ln(x^2-x-2)$

$\hookrightarrow x^2-x-2=0$

$D = b^2-4ac$

$= 1+8 = 9$

$x_1 = \frac{-b+\sqrt{D}}{2a} = \frac{1+3}{2} = 2$

$x_2 = \frac{-b-\sqrt{D}}{2a} = \frac{1-3}{2} = -1$

	-1	0	2	
x^2-x-2		-2		
$\ln(x^2-x-2)$	+ |	//////	| +	

$\Rightarrow \text{dom} f =]-\infty,-1[\ \cup\ ]2,+\infty[$

b) $\ln \frac{x}{2-x}$

$\hookrightarrow \frac{x}{2-x} = 0$

$\hookrightarrow x=0$

$\hookrightarrow 2-x=0$

$\hookrightarrow x=2$

	0	1	2
$\frac{x}{2-x}$	0	1	|
$\ln\frac{x}{2-x}$	- |	+	| -

$\Rightarrow \text{dom} f =]0,2[$

3/6 a) $y=\log_2 x$ en c) $y=\log_2(x+1)$

$f: y=2^x$

$f^{-1}: x=2^y = y\log_2 2 = \log_2 x = y$

$f: y=2^x-1$

$f^{-1}: x=2^y-1$

$2^y = x+1$

$y \log_2 2 = \log_2(x+1)$

$= y.$

3/7

a) $f: y = 10^{2x}$

$f^{-1}: x = 10^{2y}$

$2y \log 10 = \log x$

$y = \frac{1}{2} \log x$

b) $f: y = 2 \cdot 5^{x}$

$\log_a x \cdot y = \log_a x + \log_a y$

$f^{-1}: x = 2 \cdot 5^{y}$

$\log_5 x = \log_5 2 + \log_5 5^{y}$

$\log_5 x = \log_5 2 + y \log_5 5$

$y \log_5 5 = \log_5 x - \log_5 2$

$y = \log_5 x - \log_5 2$

c) $y = 3 \cdot e^{x} - 1 = f:$

$\ln(x \pm 1) \neq \ln x + \ln 1$

$f^{-1}: x = 3 \cdot e^{y} - 1$

$x + 1 = 3 \cdot e^{y} - 1 + 1$

$\ln(x+1) = \ln 3 + \ln e^{y}$

$y = \ln(x+1) - \ln 3$

3/10

a) $3^x = 2^{x+1}$

$x \ln 3 = (x+1)\ln 2$

$x\ln 3 = x\ln 2 + \ln 2$

$x\ln 3 - x\ln 2 = \ln 2$

$x(\ln 3 - \ln 2) = \ln 2$

$x = \dfrac{\ln 2}{\ln 3 - \ln 2}$

b) $e^{2x+1} = \frac{1}{2}$

$(2x+1)\ln e = \ln \frac{1}{2}$

$2x \ln e + \ln e = \ln \frac{1}{2}$

$2x = \dfrac{\ln \frac{1}{2} - \ln e}{\boxed{\ln e}} \rightarrow 1.$

c) $e^{9-x^2} - 8 = 0$

$(9-x^2)\ln e = \ln 8$

$9-x^2 = \ln 8$

$x^2 = 9 - 3\ln 2$

$x = \sqrt{9-3\ln 2}$

$\ln e = 1$

$\ln 8 = \ln 2^3 = 3\ln 2$

d) $a^{b^x} = c$

$b^x \log_a a = \log_a c$

$b^x = \dfrac{\log_a c}{\log_a a} = \log_a c$

$x\log_b b = \log b \log_a c$

$x = \log b \log_a c$

e) $e^{\sqrt{x}} = 2$

$\sqrt{x}\ln e = \ln 2$

$\sqrt{x} = \ln 2$

$x = (\ln 2)^2$

3/10

f) $e^{x} = 2e^{-x}$

$x \ln e = \ln 2 + -x \ln e$

$x = \ln 2 - x$

$2x = \ln 2$

$x = \frac{\ln 2}{2}$

g) $e^{-2x} - 7e^{-x} = 8$

$e^{-2x} - 7e^{-x} - 8 = 0$ stel $y = e^{-x}$

$y^2 - 7y - 8 = 0$

$D = b^2 - 4ac$

$= (-7)^2 - 4 \cdot 1 \cdot -8$

$= 49 + 32$

$= \underline{81}$

$y1 = \frac{-b + \sqrt{D}}{2a} = \frac{7+9}{2} = 8$

$y2 = \frac{-b - \sqrt{D}}{2a} = \frac{7-9}{2} = -1$

$\Rightarrow y1 = 8 = e^{-x}$

$\Rightarrow 3\ln 2 = -x \ln e$

$\Rightarrow x = -3\ln 2$

$\ln 8 = \ln 2^3$

$= 3 \ln 2$

$\Rightarrow y2 = -1 = e^{-x}$

$\Rightarrow -x \ln e = \ln(-1) \Rightarrow$ gaat niet

$x = -3 \ln 2$

$$2^{x+1} - 3\cdot 4^{x} + 8\cdot 2^{x-2} = 1$$

3/10 b) $2^{x}\cdot 2^{1} - 3\cdot 2^{x}\cdot 2^{x} + \frac{8}{2^{2}}\cdot 2^{x} = 1$ Stel $y = 2^{x}$

$2y - 3y^{2} + 2y - 1 = 0$

$-3y^{2} + 4y - 1 = 0$

$D = b^{2} - 4ac$

$= 16 - 4\cdot -3\cdot -1$

$= 16 - 12 = 4$

$y_1 = \frac{-b+\sqrt{D}}{2a} = \frac{-4+2}{-6} = 1$

$y_2 = \frac{-b-\sqrt{D}}{2a} = \frac{-4-2}{-6} = \frac{1}{3}$

$y = 1 = 2^{x}$

$x\ln 2 = \ln 1$

$x = \frac{\ln 1}{\ln 2}$

$x\log_2 2 = \log_2 1$

$x = 0$

$y = \frac{1}{3} = 2^{x}$

$x\log_2 2 = \log_2 1 - \log_2 3$

$x = -\log_2 3$

$\{0, -\log_2 3\}$

3/11

a) $\log(4x-5) = 1{,}5$

$\log_{10}(4x-5) = 1{,}5$

$10^{1{,}5} = 4x-5$

$10^{\frac{3}{2}} = 4x-5$

$4x = \sqrt{10^3} + 5$

$x = \frac{10\sqrt{10} + 5}{4}$

b) $\log_3(x+4) + \log_3(x-2) = 2\log_3 x$

$\log_3(x+4)(x-2) = 2\log_3 x$

$\log_3(x^2 - 2x + 4x - 8) = 2\log_3 x$

$\log_3(x^2 + 2x - 8) - \log_3 x^2 = 0$

$\log_3 \frac{x^2 + 2x - 8}{x^2} = 0$

$\log_3 2x - 8 = 0$

$2x - 8 = 0$

$x = 4$

c) $\log_x 4 = \log_4 x$

$\{4, \frac{1}{4}\}$

d) $\ln \ln x = 0$

$e^{\ln \ln x} = e^0$

$e^{\ln x} = 1$

$x = e^1 = e$

3/11

e) $2 \cdot \log_4 (9x-1) - 2 \log_2 3x = 1$

$\log_4 (9x-1)^2 - 2 \dfrac{\log_4 3x}{\log_4 2} = 1$

$\log_4 (9x-1)^2 \cdot \underbrace{\log_4 2^2}_{1} - \cancel{2} \log_4 (3x)^2 = \log_4 (2)^2$

$\log_4 (9x-1)^2 - \log_4 (3x)^2 = \underline{1}$

$\log_4 \dfrac{(9x-1)^2}{9x^2} = 1$

$\log_4 \dfrac{81x^2 - 18x + 2}{9x^2} = 1$

$\log_4 \dfrac{81}{9} \dfrac{-18}{9x} \dfrac{+2}{9} = 1$

$\log_4$

$\log_a c = \dfrac{\log_b c}{\log_b a}$

$(9x-1)(9x-1)$

$\hookrightarrow 81x^2 - 9x - 9x + 2$

$81x^2 - 18x + 2$

3/11

f) $\log_2 \log_x 81 = 2$

$\log_x 81 = 4$

$x^4 = 81$

$x = \sqrt[4]{81}$

$x = 3$

g) $\ln x^2 + \ln^3 x - 4\ln^2 x = 0$ — stel $y = \ln x$

$2\ln x + \ln^3 x - 4\ln^2 x = 0$

$2y + y^3 - 4y^2 = 0$

$y(y^2 - 4y + 2)$

$D = b^2 - 4ac$

$= 16 - 4 \cdot 1 \cdot 2$

$= 8 \Rightarrow \sqrt{D} = 2\sqrt{2}$

$y_1 = \dfrac{-b + \sqrt{D}}{2a} = \dfrac{4 + 2\sqrt{2}}{2} = 2 + \sqrt{2}$

$y_2 = \dfrac{-b - \sqrt{D}}{2a} = \dfrac{4 - 2\sqrt{2}}{2} = 2 - \sqrt{2}$

$y = 2 \pm \sqrt{2} = \ln x$

$\Rightarrow x = e^{2 \pm \sqrt{2}}$

$y = 0 = \ln x$

$x = 1$

$\left\{1, e^{2 \pm \sqrt{2}}\right\}$

h) $\log_3(3^x - 1) + x = \log_9 72^2$

$\log_3(3^x - 1) + \log_3 3^x = \dfrac{2\log_3 72}{2\log_3 9}$

$\log_3(3^x - 1) \cdot 3^x = \log_9 72$

$3^{x+x} - 3^x = 72$

$3^{2x} - 3^x = 72$ — stel $3^x = t$

$t^2 - t - 72 = 0$

$D = b^2 - 4ac$

$= 1 - 4 \cdot 1 \cdot -72$

$= 289 \Rightarrow \sqrt{D} = 17$

$\hookrightarrow x_{1,2} = \dfrac{1 \pm 17}{2}$

$= 9$

$x_{1,2} = t = 3^x$

$3^x = 9 \Rightarrow x = 2$

4/1

a) $30^\circ = \frac{30\pi}{180}$ rad $= \frac{\pi}{6}$ rad

b) $45^\circ = \frac{45\pi}{180}$ rad $= \frac{\pi}{4}$ rad.

c) $60^\circ = \frac{60\pi}{180}$ rad $= \frac{\pi}{3}$ rad.

d) $90^\circ = \frac{90\pi}{180}$ rad $= \frac{\pi}{2}$ rad.

e) $36^\circ = \frac{36\pi}{180}$ rad $= \frac{6\pi}{30}$ rad $= \frac{\pi}{5}$ rad.

f) $105^\circ = \frac{105\pi}{180} = \cancel{\frac{25\pi}{}} = \frac{21\pi}{36} = \frac{7\pi}{12}$ rad.

g) $-48^\circ = \frac{-48\pi}{180}$ rad $= \frac{-12\pi}{45} = -\frac{4\pi}{15}$ rad

h) $225^\circ = \frac{225\pi}{180}$ rad $= \frac{45\pi}{36} = \frac{5\pi}{4}$ rad.

4/2

a) $\frac{3\pi}{5} \Rightarrow \frac{\pi}{5} = 36^\circ \Rightarrow \frac{3\pi}{5} = 3 \cdot 36^\circ = 108^\circ$

b) $\frac{\pi}{9} \Rightarrow \pi = 180^\circ \Rightarrow \frac{\pi}{9} = 20^\circ$

c) $\frac{2\pi}{3} \Rightarrow \frac{\pi}{3} = 60^\circ \Rightarrow \frac{2\pi}{3} = 120^\circ$

d) $-\frac{\pi}{2} = -90^\circ$

e) $\frac{3\pi}{2} \Rightarrow \frac{\pi}{2} = 90^\circ \Rightarrow \frac{3\pi}{2} = 270^\circ$

f) $\frac{7\pi}{4} \Rightarrow \frac{\pi}{4} = 45^\circ \Rightarrow \frac{7\pi}{4} = 315^\circ$

g) $\frac{11\pi}{6} \Rightarrow \frac{\pi}{6} = 30^\circ \Rightarrow \frac{11\pi}{6} = 330^\circ$

h) $\frac{7\pi}{10} \Rightarrow \frac{\pi}{10} = 18^\circ \Rightarrow \frac{7\pi}{10} = 126^\circ$

4/3

$\sin 2x = 2\cos x \sin x$

$\sin^2 2x = (2\cos x \sin x)^2 = 4\cos^2 x \sin^2 x$

$\cos 2x = \cos^2 x - \sin^2 x$

$\cos^2 x = (\cos^2 x - \sin^2 x)(\cos^2 x - \sin^2 x)$

$= \cos^4 x - \sin^2 x \cos^2 x - \sin^2 x \cos^2 x + \sin^4 x$

$= \cos^4 x + \sin^4 x - 2\sin^2 x \cos^2 x$

$= (\cos^2 x + \sin^2 x)(\cos^2 x + \sin^2 x) - 2\sin^2 x \cos^2 x$

$= 1 \cdot 1 - 2\sin^2 x \cos^2 x$

$= 1 - 2\sin^2 x \cos^2 x$

$= 1 - \dfrac{\sin^2 2x}{2}$

$1 - \dfrac{\sin^2 2x}{2} + 4\cos^2 x \sin^2 x$

$\dfrac{2 - \sin^2 2x + 8\cos^2 x \sin^2 x}{2}$

$1 - 2\sin^2 x \cos^2 x + 4\cos^2 x \sin^2 x \cancel{= \cos^2 2x + \sin^2 2x}$

$\cancel{\cos^2 2x + \sin^2 2x = 1}$

$\cos^2 2x + \sin^2 2x = 1 + 2\sin^2 x \cos^2 x$

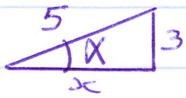
$= 1 + \sin^2 2x$

4/3 Van een hoek x is geweten dat $\sin^2 x + \cos^2 x = 1$

Bereken dan $\sin^2 2x + \cos^2 2x$

4/4 Bereken $\cos \alpha$ als:

a) $\sin \alpha = \frac{3}{5}$

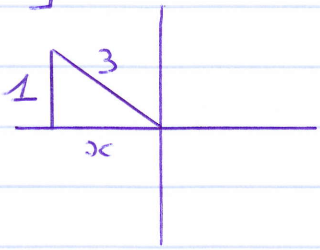


$\cos \alpha = \frac{x}{5}$

$5^2 = 3^2 + x^2$

$x = \sqrt{16} = 4 \Rightarrow \cos \alpha = \frac{4}{5}$

b) $\sin \alpha = \frac{1}{3}$ en $\alpha \in [\frac{\pi}{2}, \pi]$



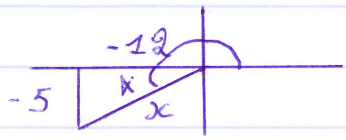
$\cos \alpha = -\frac{x}{3}$

$3^2 = 1^2 + x^2$

$x = 2\sqrt{2} \Rightarrow \cos \alpha = \frac{-2\sqrt{2}}{3}$

4/5 Bereken sin en cos α als:

a) $tg\, \alpha = \frac{5}{12}$ en α behoort tot het 3^de kwadrant



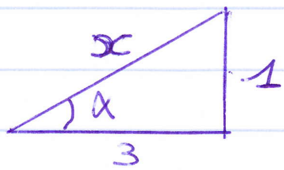
$x^2 = 5^2 + 12^2$

$x = \sqrt{13^2} = \sqrt{169} \Rightarrow x = 13$

$\sin \alpha = \frac{-5}{13}$

$\cos \alpha = \frac{-12}{13}$

b) $cotg\, \alpha = \frac{3}{1}$



$x^2 = 1^2 + 3^2$

$x = \sqrt{10}$

$\sin \alpha = \frac{1}{\sqrt{10}} \Rightarrow \frac{\sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{\pm\sqrt{10}}{10}$

$\cos \alpha = \frac{3}{\sqrt{10}} \Rightarrow \frac{3 \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{\pm 3\sqrt{10}}{10}$

4/6

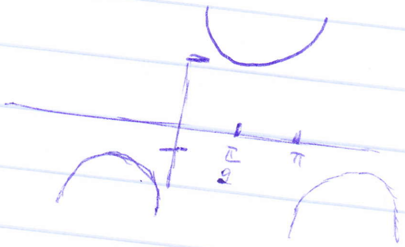
a) $y = \sec x = \dfrac{1}{\cos x}$

$\operatorname{dom} f : \mathbb{R} \setminus \left\{ \frac{\pi}{2}(2k+1) \,\middle|\, k \in \right.$

$\operatorname{bld} f :]\infty, 1] \cup [1, +\infty[$

$T = 2\pi$

b) $y = \operatorname{cosec} x$

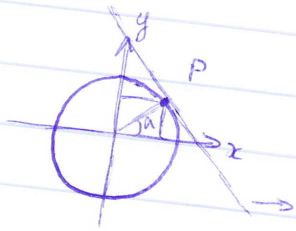


$\operatorname{dom} f : \mathbb{R} \setminus \{ \pi k \mid k \in \mathbb{Z} \}$

$\operatorname{bld} f :]-\infty, -1] \cup [1, +\infty[$

$T = 2\pi$

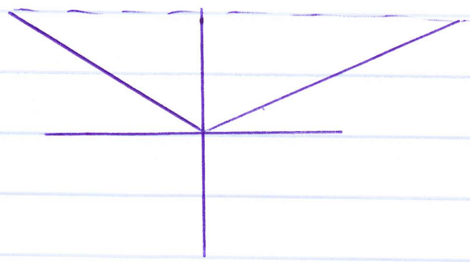
4/7



$\rightarrow \cos x \cdot x + \sin x \cdot y = 1$

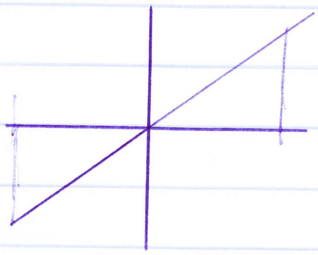
4/9

a) $\sin \frac{3\pi}{4} = \sin 135^\circ$



$\sin \frac{3\pi}{4} = \sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$

b) $\cos \frac{4\pi}{3} = \cos 240^\circ$



$\cos \frac{\pi}{3} = \frac{1}{2} \Rightarrow \cos \frac{4\pi}{3} = -\frac{1}{2}$

c) $tg\left(\frac{-\pi}{3}\right)$

$tg \frac{\pi}{3} = \sqrt{3} \Rightarrow tg\left(-\frac{\pi}{3}\right) = -\sqrt{3}$

d) $cotg\left(-\frac{17\pi}{6}\right)$

$cotg \frac{\pi}{6} = \sqrt{3}$

$cotg -\frac{17\pi}{6} = -\sqrt{3}$

4/10

a) $$\frac{\cos\left(\frac{\pi}{2}-\alpha\right)}{tg\,(\pi+\alpha)} = \frac{\sin\alpha}{tg\,\alpha} = \frac{\sin\alpha}{\frac{\sin\alpha}{\cos\alpha}} = \frac{\cancel{\sin\alpha}\cos\alpha}{\cancel{\sin\alpha}} = \cos\alpha$$

b) $$\frac{cotg\,(\pi+\alpha)\cdot\sin\left(\frac{\pi}{2}-\alpha\right)}{tg\,(-\alpha)\cdot\cos(\pi-\alpha)}$$

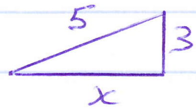
$$= \frac{cotg\,\alpha\cdot\cos\alpha}{-tg\,\alpha\cdot -\cos\alpha} = \frac{\frac{-\cos\alpha}{\sin\alpha}\cdot\cos\alpha}{\frac{-\sin\alpha}{\cancel{\cos\alpha}}\cdot\cancel{-\cos\alpha}} = \frac{-\cos^2\alpha}{\sin\alpha}\cdot\frac{1}{\sin\alpha\cdot -1}$$

$$= \frac{-\cos^2\alpha}{-\sin^2\alpha} = \frac{\cos^2\alpha}{\sin^2\alpha} = cotg^2\alpha$$

4/11

Bereken $\sin 2\alpha$, $\cos 2\alpha$ $tg\,2\alpha$ als $\sin\alpha = \frac{3}{5}$

a) $$\sin 2\alpha = 2\sin\alpha\cos\alpha = 2\cdot\frac{3}{5}\cdot\frac{4}{5} = \frac{24}{25}$$



$5^2 = x^2 + 3^2$

$x = 4$

b) $$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha = \left(\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2 = \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$$

c) $$tg\,2\alpha = \frac{\sin 2\alpha}{\cos 2\alpha} = \frac{\frac{24}{25}}{\frac{7}{25}} = \frac{24}{\cancel{25}}\cdot\frac{\cancel{25}}{7} = \frac{24}{7}$$

4/12 Als je weet dat $\cos\theta = -\frac{4}{5}$ en $\theta \in [\pi, \frac{3\pi}{2}]$, bereken dan:

a) $\sin\theta = \frac{-3}{5}$

b) $\cos 2\theta = \cos^2\theta - \sin^2\theta$

$= \left(\frac{-4}{5}\right)^2 - \left(\frac{-3}{5}\right)^2$

$= \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$

c) $\sin\frac{\theta}{2} = \pm\sqrt{\frac{1-\cos\theta}{2}}$

$= -\sqrt{\frac{1 - \frac{-4}{5}}{2}}$

$= -\sqrt{\frac{\frac{5}{5} + \frac{4}{5}}{2}} = -\sqrt{\frac{\frac{9}{5}}{2}}$

$= -\sqrt{\frac{9}{10}}$

$= \frac{-3\sqrt{10}}{10}$

d) $\cos\frac{\theta}{2} = \pm\sqrt{\frac{1+\cos\theta}{2}}$

$= -\sqrt{\frac{1 + \frac{-4}{5}}{2}}$

$= -\sqrt{\frac{\frac{5}{5} - \frac{4}{5}}{2}} = -\sqrt{\frac{1}{10}} = -\frac{\sqrt{10}}{10}$

e) $\sin 2\theta = 2\cos x \sin x$

$= 2 \cdot \frac{-4}{5} \cdot \frac{-3}{5}$

$= \frac{24}{25}$

4/13

a) $\operatorname{tg} \alpha + \operatorname{cotg} \alpha = \frac{2}{\sin 2\alpha}$

$= \frac{\sin \alpha}{\cos \alpha} + \frac{\cos \alpha}{\sin \alpha}$

$= \frac{\sin^2 \alpha + \cos^2 \alpha}{\cos \alpha \sin \alpha}$

$= \frac{1}{\cos \alpha \sin \alpha} = \frac{2}{2 \cos \alpha \sin \alpha} = \frac{2}{\sin 2\alpha}$

b) $\operatorname{tg} x = \frac{2 \operatorname{tg} \frac{x}{2}}{1 - \operatorname{tg}^2 \frac{x}{2}}$

tip: $\sin \alpha = 2 \sin \frac{x}{2} \cos \frac{x}{2}$

$\cos \alpha = \cos^2 \frac{x}{2} - \sin^2 \frac{x}{2}$

$\operatorname{tg} \alpha = \frac{\sin \alpha}{\cos \alpha} = \frac{2 \cdot \sin \frac{\alpha}{2} \cos \frac{\alpha}{2}}{\cos^2 \frac{\alpha}{2} - \sin^2 \frac{\alpha}{2}} \cdot 1 = \frac{2 \cdot \sin \frac{\alpha}{2} \cancel{\cos \frac{\alpha}{2}}}{\cancel{\cos^2 \frac{\alpha}{2}} - \sin^2 \frac{\alpha}{2}} \cdot \frac{\cancel{\cos^2 \frac{\alpha}{2}}}{\cos^2 \frac{\alpha}{2}}$

$= \frac{2 \cdot \sin \frac{\alpha}{2}}{- \sin^2 \frac{\alpha}{2} \cos^2 \frac{\alpha}{2}}$

4/13

a) $\operatorname{tg} x + \operatorname{cotg} x = \dfrac{2}{\sin 2x}$

$$= \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x}$$

$$= \frac{\sin^2 x + \cos^2 x}{\cos x \sin x} = \frac{1}{\cos x \sin x} = \frac{2}{2\cos x \sin x}$$

$$= \frac{2}{\sin 2x}$$

b) $\operatorname{tg} x = \dfrac{2\operatorname{tg}\frac{x}{2}}{1-\operatorname{tg}^2\frac{x}{2}}$

$$\frac{2\operatorname{tg}\frac{x}{2}}{1-\operatorname{tg}^2\frac{x}{2}} = \frac{2\left(\frac{1-\cos x}{\sin x}\right)}{1-\left(\frac{1-\cos x}{\sin x}\right)^2} = \frac{\frac{2-2\cos x}{\sin x}}{1-\left(1+\frac{\cos^2 x}{\sin^2 x}\right)}$$

$$= \frac{\frac{2-2\cos x}{\sin x}}{\cancel{1-1}-\frac{\cos^2 x}{\sin^2 x}} = \left(\frac{2-2\cos x}{\sin x}\right)\left(\frac{-\sin^2 x}{\cos^2 x}\right)$$

$$= \frac{-2\sin^2 x}{\cos^2 x} + \frac{2\cancel{\cos x}\sin^{\cancel{2}} x}{\cancel{\sin x}\cos^{\cancel{2}} x}$$

$$= \frac{-2\sin^2 x}{\cos^2 x} + \frac{2\sin x}{\cos x}$$

$$= -2\operatorname{tg}^2 x + 2\cdot\cancel{\sin}\operatorname{tg} x$$

$$= -2\cdot\frac{1}{\cos^2 x} + 2\cdot\frac{\sin x}{\cos x}$$

$$= \frac{-2+2\sin x\cos x}{\cos^2 x}$$

$$= \frac{-2+\sin 2x}{\cos^2 x}$$

4/13

c) $\dfrac{\sin(x+y)}{\cos(x-y)} = \dfrac{\sin x \cos y + \cos x \sin y}{\cos x \cos y + \sin x \sin y}.$

d) $\dfrac{\cos\frac{\alpha}{2} + \sin\frac{\alpha}{2}}{\cos\frac{\alpha}{2} - \sin\frac{\alpha}{2}} \cdot \dfrac{\cos\frac{\alpha}{2} + \sin\frac{\alpha}{2}}{\cos\frac{\alpha}{2} + \sin\frac{\alpha}{2}}$

$= \dfrac{\cos^2\frac{\alpha}{2} + \sin^2\frac{\alpha}{2} + 2\sin\frac{\alpha}{2}\cos\frac{\alpha}{2}}{\cos^2\frac{\alpha}{2} - \sin^2\frac{\alpha}{2}}$

$= \dfrac{1 + \sin\frac{\alpha}{2}}{\cos 2\alpha}$

4/13

$$\frac{\sin(x+y)}{\cos(x-y)} = \frac{tg\,x + tg\,y}{1 + tg\,x \cdot tg\,y}$$

$$= \frac{\sin x \cos y + \cos x \sin y}{\cos x \cos y - \sin x \sin y}$$

$=$

4/18

a) $\cos 4x \quad \frac{1}{2}$

$\cos y = \frac{1}{2}$

$y = \frac{\pi}{3} = 4x$

$x = \frac{\pi}{12} + k\frac{\pi}{2} \mid k \in \mathbb{Z}$

b) $x^2 \cos \alpha - 2x \sin \alpha - \cos \alpha = 0$

$D = 4\sin^2\alpha + 4\cos^2\alpha$

$= 4 \cdot 1$

$x_1 = \frac{+\cancel{2}\sin\alpha + \cancel{2}}{\cancel{2}\cdot\cos\alpha}$

$= \operatorname{tg}\alpha + \sec\alpha$

$x_2 = \operatorname{tg}\alpha - \sec\alpha$

c) $\sin\alpha = \cos\alpha$

$\Rightarrow \cancel{x} = \frac{\pi}{4} + k\pi \mid k \in \mathbb{Z}$

d) $\sin 3\alpha + \sin\alpha = 0$

$\sin 3\cancel{\alpha} = -\sin\alpha$

$\Rightarrow 0 + k\frac{\pi}{2} \mid k \in \mathbb{Z}$

e) $2x^2 - 2x\sqrt{2} - \cos 2\alpha = 0$

$D = 2\sqrt{2}^2 - 4ac$

$= 8 - 4 \cdot 2 \cdot (-\cos 2\alpha)$

$= 8 + 8\cos 2\alpha$

$= 8(1 + \cos 2\alpha)$

$= 8 \cdot 2\cos^2\alpha$

$\Rightarrow \sqrt{D} = 4\cos\alpha$

$x_1 = \frac{2\sqrt{2} + 4\cos\alpha}{2\cdot 2} = \frac{2\sqrt{2} + \cancel{4}\cos\alpha}{2\cdot 2}$

$x_2 = \frac{2\sqrt{2} - 4\cos\alpha}{4} = \frac{2\sqrt{2} - 4\cos\alpha}{4}$

5/2

a) $\text{Bgsin}\,\frac{1}{2} = \frac{\pi}{6}$

Want $\sin\frac{\pi}{6} = \frac{1}{2}$

b) $\text{Bgtg}\,\frac{\sqrt{3}}{3} = \frac{\pi}{6}$

Want $\text{tg}\,\frac{\pi}{6} = \frac{\sqrt{3}}{3}$

c) $\text{Bgtg}\,-1 = -\frac{\pi}{4}$

Want $\text{tg}\,-\frac{\pi}{4} = -1$

d) $\text{Bgcos}\,0 = \frac{\pi}{2}$

Want $\cos\frac{\pi}{2} = 0$

e) $\text{Bgtg}\,\sqrt{3} = \frac{\pi}{3}$

Want $\text{tg}\,\frac{\pi}{3} = \sqrt{3}$

f) $\text{Bgcos}\,-\frac{1}{2} = \frac{2\cdot\pi}{3}$

Want $\cos\frac{2\pi}{3} = -\frac{1}{2}$

g) $\text{Bgcos}\,-1 = \pi$

Want $\cos\pi = -1$

h) $\text{Bgcotg}\,\sqrt{3} = \frac{\pi}{6}$

Want $\text{cotg}\,\frac{\pi}{6} = \sqrt{3}$

i) $\text{Bgsin}\,\frac{\sqrt{3}}{2} = \frac{\pi}{3}$

Want $\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

j) $\text{Bgtg}\,1 = \frac{\pi}{4}$

Want $\text{tg}\,\frac{\pi}{4} = 1$

5/2

b) $\operatorname{Bgcos} \frac{1}{2} = \frac{\pi}{3}$

Want $\cos \frac{\pi}{3} = \frac{1}{2}$

l) $\operatorname{Bgcotg} -1 = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$

Want $\operatorname{cotg} \frac{3\pi}{4} = -1$

m) $\operatorname{Bgsin} \frac{-\sqrt{2}}{2} = \frac{-\pi}{4}$

Want $\sin \frac{-\pi}{4} = \frac{-\sqrt{2}}{2}$

n) $\operatorname{Bgtg} \frac{-\sqrt{3}}{3} = -\frac{\pi}{6}$

Want $\operatorname{tg} \frac{-\pi}{6} = \frac{-\sqrt{3}}{3}$

o) $\operatorname{Bgcos} \frac{-\sqrt{2}}{2} = \pi - \frac{\pi}{4} = \frac{3\pi}{4}$

Want $\cos \frac{3\pi}{4} = \frac{-\sqrt{2}}{2}$

p) $\operatorname{Bgcotg} \frac{-\sqrt{3}}{3} = \frac{2\pi}{3}$

Want $\operatorname{cotg} \frac{2\pi}{3} = \frac{-\sqrt{3}}{3}$

5/3

a) $\sin(Bg\sin 7) \Rightarrow$ Bestaat niet

b) $\cos\left(Bg\sin\frac{1}{3}\right)$

$\cos^2 x + \sin^2 x = 1$

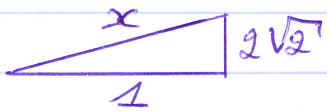
$\cos x = \sqrt{1-\sin^2 x}$

$\cos\left(Bg\sin\frac{1}{3}\right) = \sqrt{1-\frac{1}{9}}$

$= \sqrt{\frac{8}{9}}$

$= \frac{2\sqrt{2}}{3}$

c) $\sin(Bgtg\, 2\sqrt{2})$

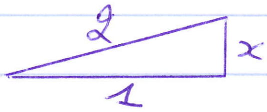


$x = \sqrt{1 + 2\sqrt{2}^2}$

$x = 3$

$\sin(Bgtg\, 2\sqrt{2}) = \frac{2\sqrt{2}}{x} = \frac{2\sqrt{2}}{3}$

d) $tg\left(Bg\cos\frac{1}{2}\right)$

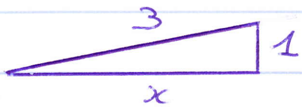


$x = \sqrt{2^2 - 1^2}$

$x = \sqrt{3}$

$tg\left(Bg\cos\frac{1}{2}\right) = \frac{\sqrt{3}}{1}$

e) $\sin\left(2\,Bg\sin\frac{1}{3}\right) = \sin 2x$



$x = \sqrt{3^2 - 1^2}$

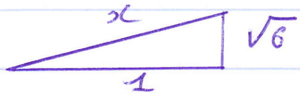
$= 2\sqrt{2}$

$\sin 2x = 2 \cdot \sin x \cos x$

$\sin 2x = 2 \cdot \sin x \cos x$

$= 2 \cdot \frac{1}{3} \cdot \frac{2\sqrt{2}}{3} = \frac{4\sqrt{2}}{9}$

f) $\cos(2\,Bgtg\sqrt{6}) = \cos 2x$



$x = \sqrt{1 + \sqrt{6}^2}$

$x = \sqrt{7}$

$\cos 2x = \cos^2 x - \sin^2 x$

$\cos 2x = \cos^2 x - \sin^2 x$

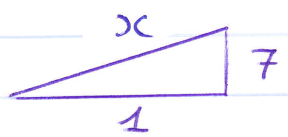
$= \left(\frac{1}{\sqrt{7}}\right)^2 - \left(\frac{\sqrt{6}}{\sqrt{7}}\right)^2 = \frac{-5}{7}$

5/3

g) $\cos\left(2 \operatorname{Bgcotg} \frac{1}{7}\right)$

$x = \sqrt{1+7^2}$

$= \sqrt{50} = 5\sqrt{2}$



$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

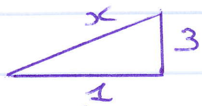
$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

$= \left(\frac{1}{5\sqrt{2}}\right)^2 - \left(\frac{7}{5\sqrt{2}}\right)^2 = \frac{1-49}{50} = \frac{-48}{50} = \frac{-24}{25}$

h) $\operatorname{cotg}(2 \operatorname{Bgtg} 3) = \operatorname{cotg} 2\alpha$

$x = \sqrt{1^2+3^2}$

$= \sqrt{10}$



$\operatorname{cotg} 2\alpha = \frac{\cos 2\alpha}{\sin 2\alpha}$

$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

$\sin 2\alpha = 2\sin\alpha\cos\alpha$

$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha$

$= \left(\frac{1}{\sqrt{10}}\right)^2 - \left(\frac{3}{\sqrt{10}}\right)^2 = \frac{-8}{10} = \frac{-4}{5}$

$\sin 2\alpha = 2\sin\cancel{\alpha} + \cos\alpha$

$= 2 \cdot \frac{3}{\sqrt{10}} \cdot \frac{1}{\sqrt{10}} = \frac{6}{10} = \frac{3}{5}$

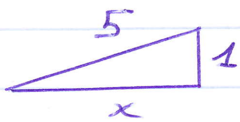
$\operatorname{cotg}(2 \operatorname{Bgtg} 3) = \operatorname{cotg} 2\alpha = \frac{\cos 2\alpha}{\sin 2\alpha}$

$= \frac{\frac{-4}{5}}{\frac{3}{5}} = \frac{-4}{\cancel{5}} \cdot \frac{\cancel{5}}{3} = \frac{-4}{3}$

i) $\sin\left(3 \operatorname{Bgsin} \frac{1}{5}\right) = \sin 3\alpha$

$x = \sqrt{5^2 - 1^2}$

$= \sqrt{24}$



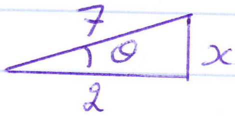
$\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$

$\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$

$= 3 \cdot \frac{1}{5} - 4 \cdot \left(\frac{1}{5}\right)^3$

$= \frac{3}{5} - \frac{4}{125} = \frac{75-4}{125} = \frac{71}{125}$

5/6 Als $\theta = \text{Bgcos}\,\frac{2}{7}$, bereken dan :



$$x = \sqrt{7^2 - 2^2}$$
$$= \sqrt{45}$$
$$= \sqrt{9 \cdot 5} = 3\sqrt{5}$$

a) $\sin\theta = \frac{3\sqrt{5}}{7}$

b) $\text{tg}\,\theta = \frac{3\sqrt{5}}{2}$

c) $\sec\theta = \frac{1}{\cos\theta} = \frac{1}{\frac{2}{7}} = \frac{7}{2}$

d) $\cos 2\theta = \cos^2\theta - \sin^2\theta$
$$= \left(\frac{2}{7}\right)^2 - \left(\frac{3\sqrt{5}}{7}\right)^2 = \frac{4}{49} - \frac{45}{49} = \frac{-41}{49}$$

e) $\sin 2\theta = 2\cos\theta\sin\theta$
$$= 2 \cdot \frac{2}{7} \cdot \frac{3\sqrt{5}}{7}$$
$$= \frac{12\sqrt{5}}{49}$$

5/7 a) $\text{Bgcos}\left(\cos\frac{\pi}{2}\right)$
$$= \frac{\pi}{2}$$

b) $\text{Bgtg}\left(\text{tg}\,\frac{3\pi}{4}\right)$
$$= \frac{-\pi}{4}$$

c) $\text{Bgsin}\left(\sin\frac{7\pi}{6}\right)$
$$= \frac{-\pi}{6}$$