EXPONENTIALS & LOGARITHMS practice

Question 1

Solve each of the following equations.

a) $e^{x+1}=17$

b) $e^{4-3y}=20$

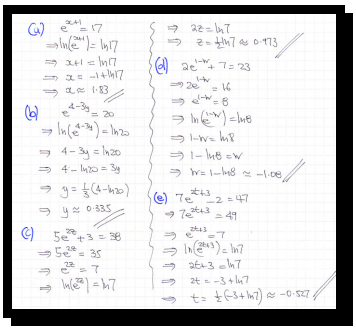
c) $5e^{2z}+3=38$

d) $2e^{1-w}+7=23$

e) $7e^{2t+3}-2=47$

$\boxed{x=-1+\ln 17\approx 1.83}$, $\boxed{y=\frac{1}{3}(4-\ln 20)\approx 0.335}$, $\boxed{z=\frac{1}{2}\ln 7\approx 0.973}$,

$\boxed{w=1-\ln 8\approx -1.08}$, $\boxed{t=\frac{1}{2}(-3+\ln 7)\approx -0.527}$



Question 2

Solve each of the following equations.

a) $e^{x-2}=10$

b) $e^{1-2y}=40$

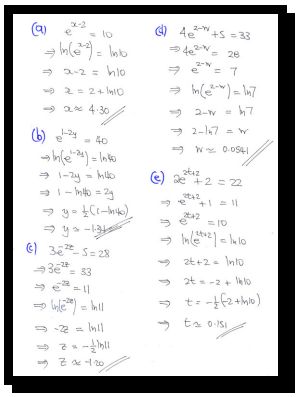
c) $3e^{-2z}-5=28$

d) $4e^{2-w}+5=33$

e) $2e^{2t+2}+2=22$

$\boxed{x=2+\ln 10\approx 4.30}$, $\boxed{y=\frac{1}{2}(1-\ln 40)\approx -1.34}$, $\boxed{z=-\frac{1}{2}\ln 11\approx -1.20}$,

$\boxed{w=2-\ln 7\approx 0.0541}$, $\boxed{t=\frac{1}{2}(-2+\ln 10)\approx 0.151}$



Question 3

Solve each of the following equations.

a) $e^{2x} = 9$

b) $5e^{1-y} = 30$

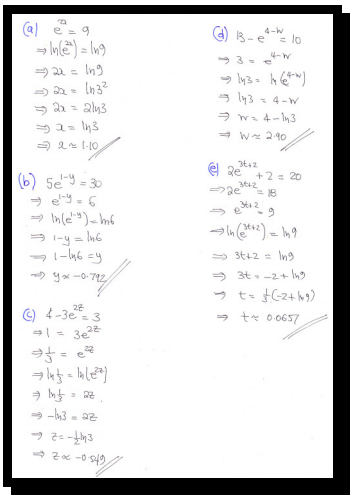
c) $4 - 3e^{2z} = 3$

d) $13 - e^{4-w} = 10$

e) $2e^{3t+2} + 2 = 20$

$\boxed{x = \ln 3 \approx 1.10}$, $\boxed{y = 1 - \ln 6 \approx -0.792}$, $\boxed{z = -\frac{1}{2}\ln 3 \approx -0.549}$,

$\boxed{w = 4 - \ln 3 \approx 2.90}$, $\boxed{t = \frac{1}{3}(-2 + \ln 9) \approx 0.0657}$



Question 4

Solve each of the following equations, leaving your final answers as expressions involving natural logarithms in their simplest form.

a) $\mathrm{e}^{x}=4$

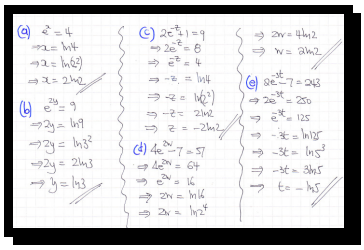
b) $\mathrm{e}^{2y}=9$

c) $2\mathrm{e}^{-z}+1=9$

d) $4\mathrm{e}^{2w}-7=57$

e) $2\mathrm{e}^{-3t}-7=243$

$\boxed{x=2\ln 2}$, $\boxed{y=\ln 3}$, $\boxed{z=-2\ln 2}$, $\boxed{w=2\ln 2}$, $\boxed{t=-\ln 5}$



Question 5

Solve each of the following equations, leaving your final answers as expressions involving natural logarithms in their simplest form.

a) $e^{2x}=16$

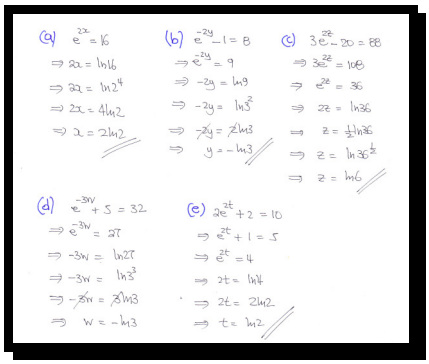
b) $e^{-2y}-1=8$

c) $3e^{2z}-20=88$

d) $e^{-3w}+5=32$

e) $2e^{2t-2}+2=10$

$\boxed{x=2\ln 2}$, $\boxed{y=-\ln 3}$, $\boxed{z=\ln 6}$, $\boxed{w=-\ln 3}$, $\boxed{t=1+\ln 2=\ln(2e)}$



Question 6

Solve each of the following equations, leaving your final answers as expressions involving natural logarithms in their simplest form.

a) $e^{4x}=16$

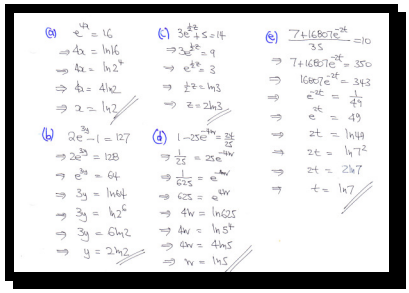
b) $2e^{3y}-1=127$

c) $3e^{\frac{z}{2}}+5=14$

d) $1-25e^{-4w}=\frac{24}{25}$

e) $\frac{7+16807e^{-2t}}{35}=10$

$\boxed{x=\ln 2}$, $\boxed{y=2\ln 2}$, $\boxed{z=2\ln 3}$, $\boxed{w=\ln 5}$, $\boxed{t=\ln 7}$



Question 7

Simplify each of the following expressions, giving the answer to the required form.

a) $2\ln 9-\ln 6-4\ln\sqrt{3}+\ln 2\equiv a\ln 3$

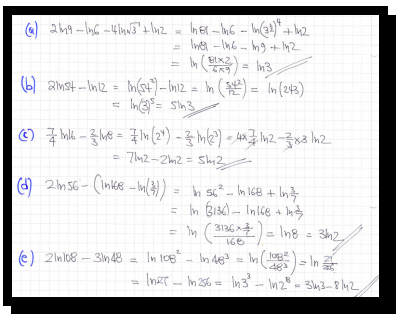
b) $2\ln 54-\ln 12\equiv b\ln 3$

c) $\frac{7}{4}\ln 16-\frac{2}{3}\ln 8\equiv c\ln 2$

d) $2\ln 56-\left[\ln 168-\ln\left(\frac{3}{7}\right)\right]\equiv k\ln 2$

e) $2\ln 108-3\ln 48\equiv p\ln 3+q\ln 2$

$\boxed{a=1}$, $\boxed{b=5}$, $\boxed{c=5}$, $\boxed{k=3}$, $\boxed{p=3, q=-8}$



Question 8

Solve each of the following logarithmic equations.

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

b) $\ln(4-y)=2$

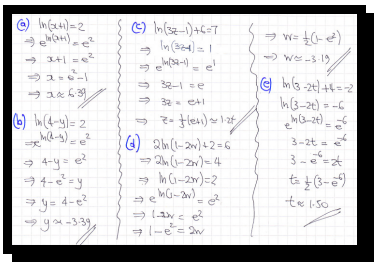
c) $\ln(3z-1)+6=7$

d) $2\ln(1-2w)+2=6$

e) $\ln(3-2t)+4=-2$

$\boxed{x=\mathrm{e}^2-1\approx 6.39}$, $\boxed{y=4-\mathrm{e}^2\approx -3.39}$, $\boxed{z=\frac{1}{3}(\mathrm{e}+1)\approx 1.24}$,

$\boxed{w=\frac{1}{2}\left(1-\mathrm{e}^2\right)\approx -3.19}$, $\boxed{t=\frac{1}{2}\left(3-\mathrm{e}^{-6}\right)\approx 1.50}$



Question 9

Solve each of the following logarithmic equations.

a) $\ln\left(x-3\right)=2$

b) $1-\ln\left(3-y\right)=-1$

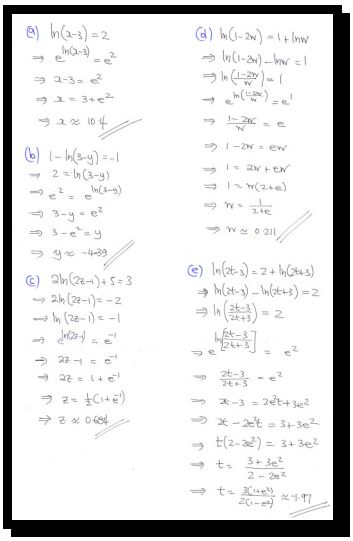
c) $2\ln\left(2z-1\right)+5=3$

d) $\ln\left(1-2w\right)=1+\ln w$

e) $\ln\left(2t-3\right)=2+\ln\left(2t+3\right)$

$$\boxed{x=\mathrm{e}^2+3\approx 10.4},\ \boxed{y=3-\mathrm{e}^2\approx -4.39},\ \boxed{z=\frac{1}{2}\left(\mathrm{e}^{-1}+1\right)\approx 0.684},$$

$$\boxed{w=\frac{1}{\mathrm{e}+2}\approx 0.212},\ \boxed{t=\frac{3\left(1+\mathrm{e}^2\right)}{2\left(1-\mathrm{e}^2\right)}\approx -1.97}$$



Question 10

Solve each of the following logarithmic equations.

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

b) $2\ln(1-y)+1=3$

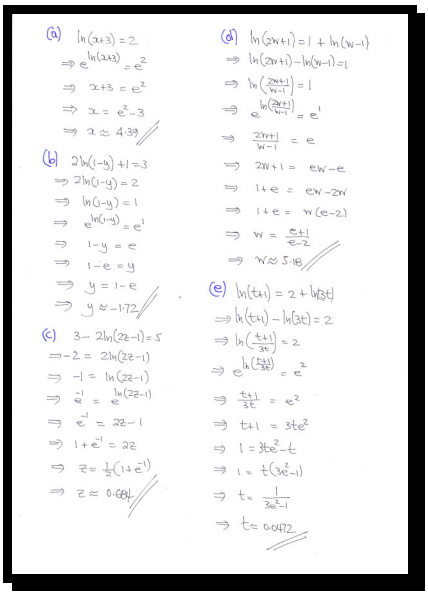
c) $3-2\ln(2z-1)=5$

d) $\ln(2w+1)=1+\ln(w-1)$

e) $\ln(t+1)=2+\ln(3t)$

$\boxed{x=\mathrm{e}^2-3\approx 4.39}$, $\boxed{y=1-\mathrm{e}\approx -1.72}$, $\boxed{z=\frac{1}{2}\left(\mathrm{e}^{-1}+1\right)\approx 0.684}$, $\boxed{w=\frac{\mathrm{e}+1}{\mathrm{e}-2}\approx 5.18}$,

$\boxed{t=\frac{1}{3\mathrm{e}^2-1}\approx 0.0472}$



Question 11

Solve each of the following logarithmic equations.

a) $\ln(3x)-\ln(x-1)=1$

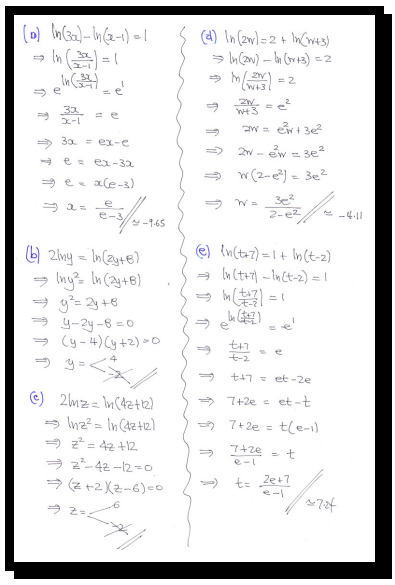
b) $2\ln y=\ln(2y+8)$

c) $2\ln z=\ln(4z+12)$

d) $\ln(2w)=2+\ln(w+3)$

e) $\ln(t+7)=1+\ln(t-2)$

$$\boxed{x=\frac{\mathrm{e}}{\mathrm{e}-3}\approx -9.65},\ \boxed{y=4,\ y\neq -2},\ \boxed{z=6,\ z\neq -2},\ \boxed{w=\frac{3\mathrm{e}^2}{2-\mathrm{e}^2}\approx -4.11},\ \boxed{t=\frac{2\mathrm{e}+7}{\mathrm{e}-1}\approx 7.24}$$



Question 12

Solve each of the following logarithmic equations.

a) $\ln(2x)-\ln(x+2)=1$

b) $2\ln y=\ln(y+20)$

c) $2\ln z=\ln(5z-6)$

d) $\ln(2w-1)=2+\ln(w-2)$

e) $\ln(4t+1)=1+\ln(3t-2)$

$\boxed{x=\dfrac{2\mathrm{e}}{2-\mathrm{e}}\approx -7.57}$, $\boxed{y=5,\ y\neq -4}$, $\boxed{z=2,\ z=3}$, $\boxed{w=\dfrac{2\mathrm{e}^2-1}{\mathrm{e}^2-2}\approx 2.56}$, $\boxed{t=\dfrac{2\mathrm{e}+1}{3\mathrm{e}-4}\approx 1.55}$

Question 13

Solve each of the following exponential equations.

a) $e^{x}+8e^{-x}=6$

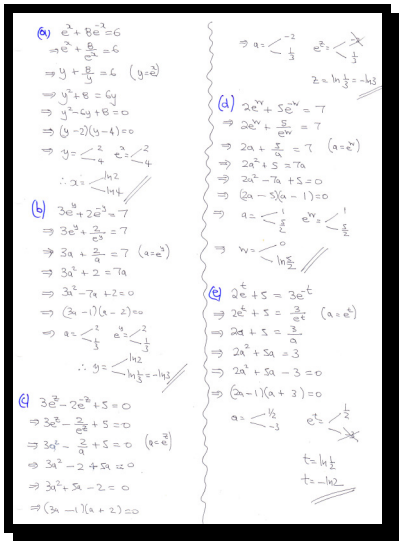
b) $3e^{y}+2e^{-y}=7$

c) $3e^{z}-2e^{-z}+5=0$

d) $2e^{w}+5e^{-w}=7$

e) $2e^{t}+5=3e^{-t}$

$\boxed{x=\ln 2, 2\ln 2}$, $\boxed{y=\ln 2, -\ln 3}$, $\boxed{z=-\ln 3}$, $\boxed{w=0, \ln\left(\frac{5}{2}\right)}$, $\boxed{t=-\ln 2}$



Question 14

Solve each of the following exponential equations.

a) $e^{x}+3e^{-x}=4$

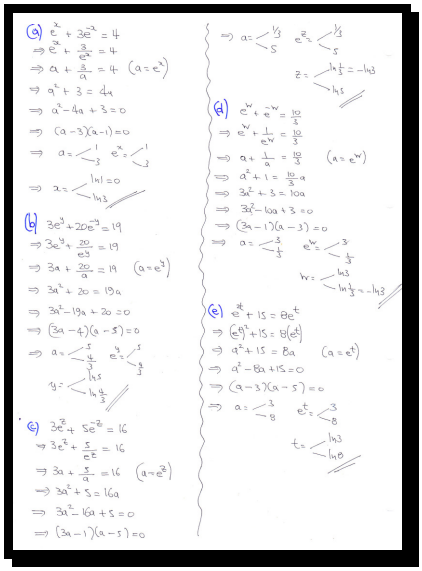
b) $3e^{y}+20e^{-y}=19$

c) $3e^{z}+5e^{-z}=16$

d) $e^{w}+e^{-w}=\frac{10}{3}$

e) $e^{2t}+15=8e^{t}$

$\boxed{x=0,\ln 3}$, $\boxed{y=\ln 5,\ \ln\left(\frac{4}{3}\right)}$, $\boxed{z=\ln 5,-\ln 3}$, $\boxed{w=\pm\ln 3}$, $\boxed{t=\ln 3,\ln 5}$



Question 15

Solve each of the following exponential equations.

a) $e^{x}-8e^{-x}=2$

b) $2\left(e^{y}+e^{-y}\right)=5$

c) $\dfrac{8e^{z}}{e^{2z}-1}=3$

d) $e^{w}-3=\dfrac{8}{e^{w}-1}$

e) $e^{2t}+e^{-2t}=4$

$\boxed{x=2\ln 2}$, $\boxed{y=\pm\ln 2,}$, $\boxed{z=\ln 3}$, $\boxed{w=\ln 5}$, $\boxed{t=\frac{1}{2}\ln\left(2\pm\sqrt{3}\right)=\pm\frac{1}{2}\ln\left(2+\sqrt{3}\right)}$

