1. [3 marks] Solve $\left(\frac{7^{4x}}{7^2}\right)^{1/2} = 7^{4x-4}$

$$\left(7^{4x-2}\right)^{1/2} = 7^{4x-4}$$

$$7^{2x-1} = 7^{4x-4}$$

equal bases $\Rightarrow$ $2x-1 = 4x-4$

$$3 = 2x$$

$$x = 3/2$$

2. [2 marks] Solve $\log_x 8 = 3$

$$x^3 = 8$$

$$x = 2$$

3. [2 marks] Write the expression as a single logarithm:

$3\ln x - 5\ln(x-1)$

$= \ln x^3 + \ln(x-1)^{-5}$

$= \ln\left[x^3(x-1)^{-5}\right]$ or $\ln\left[\frac{x^3}{(x-1)^5}\right]$

4. [4 marks] A culture of bacteria grows according to $N = 25e^{0.5\ln(1.7)t}$ where N represents the mass in grams and t represents the time in hours. After how long will the mass reach 100 grams? Round your answer to one decimal place.

$100 = 25e^{0.5\ln(1.7)t}$

$4 = e^{0.5\ln(1.7)t}$

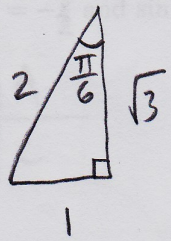
$\ln 4 = \ln e^{0.5\ln(1.7)t}$

$\ln 4 = 0.5\ln(1.7)t$

$\frac{\ln 4}{0.5\ln(1.7)} = t$

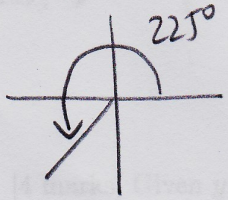
$t \approx 5.2$ hours

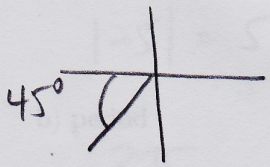
5. [2 marks] Find the exact value of $\sec \frac{\pi}{6}$



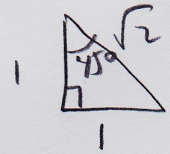
$$\sec \frac{\pi}{6} = \frac{H}{A} = \frac{2}{\sqrt{3}} \text{ or } \frac{2\sqrt{3}}{3}$$

6. [2 marks] Find the exact value of $\sin 225°$





S	A
T	C



$$\sin 225° = -\sin 45°$$
$$= \frac{-1}{\sqrt{2}} \text{ or } \frac{-\sqrt{2}}{2}$$

7. [3 marks] Find the exact value of $\cos\theta$ given:

$\tan\theta = -\frac{3}{2}$ and $\sin\theta > 0$

S | A

T | C

So $x<0$ and $y>0$

$\tan\theta = \frac{y}{x} = -\frac{3}{2}$

So $y=3$ $x=-2$ $r = \sqrt{x^2+y^2}$

$= \sqrt{9+4}$

$= \sqrt{13}$

$\cos\theta = \frac{x}{r} = \frac{-2}{\sqrt{13}}$ or $\frac{-2\sqrt{13}}{13}$

8. [4 marks] Given $y = -5\sin(3x+\pi)$, find the:

a) amplitude

$|-5| = 5$

b) period

$\frac{2\pi}{3}$

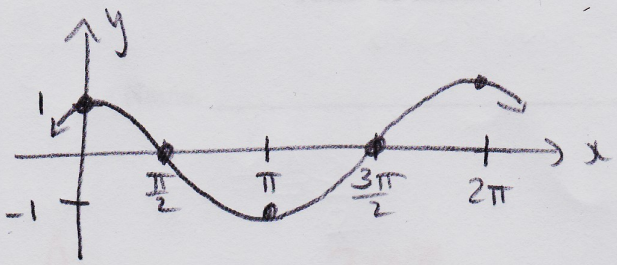
c) phase shift (indicate right or left, and the amount of shift)

$y = -5\sin(3(x+\frac{\pi}{3}))$

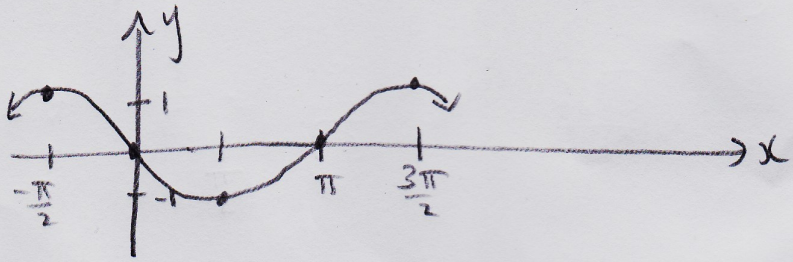
$\frac{\pi}{3}$ units left

9. [3 marks] Graph one period of each of the following functions. Clearly indicate the scale on the x-axis and the y-axis.

a) $y = \cos x$



b) $y = \cos(x + \pi/2)$



c) $y = -4\cos(x + \pi/2)$