1. Simplify:

   a) (5 marks) $(2\sqrt{2}a^2b^{-1/4})^2(2a^{1/3}b^{-1/2})^{-3}$;

   b) (5 marks)
   $$\frac{3^{-1}+2^3}{(-1)^3+(-3)^2}.$$

2. **(10 marks)** In a certain mathematics class, the average weight for the girls was 64 kg, for the boys 80 kg and for the class as a whole, 73 kg. How many people are in the class given that there are 14 girls?

3. Solve the following inequalities:

   a) (5 marks) $|x+5|<1$;

   b) (5 marks) $|-2x+3|>3$.

4. **(10 marks)** Find the point of intersection of the two lines given below. Then write the equation of the line through that point perpendicular to the line given first.

$$\begin{aligned} 5x-2y &= 5 \\ -3x+3y &= 6 \end{aligned}$$

5. **a) (8 marks)** Sketch the graph of the curve $(x-1)=-4(y+2)^2$. Give the coordinates of at least three points on the curve including the vertex.

   c) (2 marks) Could the graph of part a) be the graph of a function? (Explain your answer.)

6. **a) (5 marks)** Factor $3x^3+2x^2-12x-8$ over the integers.

   b) (5 marks) Sketch the graph of the polynomial function $f(x)=3x^3+2x^2-12x-8$.

7. **a) (5 marks)** Sketch the graph of the following rational function

$$f(x) = \frac{5-x}{5+x}.$$

b) (2 marks) Give the equations of the asymptotes in the graph of part a).

c) (3 marks) Is the function $f(x)$ given in part a) one-to-one? (Explain your answer.)

8. Solve for x :

a) (5 marks) $\sqrt{x} = 12 - x$;

b) (5 marks) $3^x + 3^{3-x} = 12$.

9. **a) (2 marks)** Which of the following two equations is an example of exponential growth, and which is an example of exponential decay? (Justify your answer.)

$$p(t) = 100(1.01)^t, \qquad q(t) = 50(0.75)^t.$$

b) (2 marks) Is doubling time associated with exponential growth, or with exponential decay? How about half-life, is it associated with exponential growth or with exponential decay?

c) (6 marks) Using the values for the ln function given below, estimate the half-life and doubling times (as appropriate) corresponding to the two equations of part a). You may assume that t is measured in years ($\cong$ denotes "approximately equal.")

$\ln 200 \cong 5.3$	$\ln 100 \cong 4.6$	$\ln 50 \cong 3.9$	$\ln 25 \cong 3.2$
$\ln 1.01 \cong 0.01$	$\ln 0.75 \cong -0.3$	$\ln 2 \cong 0.7$	$\ln(1/2) \cong -0.7$

10. **(10 marks)** Fill in all the blanks in the following table.

$\sin t$	$\cos t$	$\sin(t+\pi)$	$\cos(t+\pi)$	$\sin(\pi-t)$	$\tan t$	$\sec t$
$\sqrt{3}/2$	$-1/2$					
	$3/5$	$4/5$				

11. **(10 marks)** Prove that $\sec t - \sin t \tan t = \cos t$ is an identity.

12. Find the value of each of the following:

    a) (5 marks) $\cos^{-1}(\sin(-\pi/3))$;

    b) (5 marks) $\sin(\cos^{-1}(4/5))$.