

**Y12 : PRACTICE ASSESSMENT B. MERIT LEVEL ONLY.**

**Algebra.**

1. If  $B = K(0.8)^t$  find :

(a) the value of  $K$  given that when  $t = 0, B = 240$

Sub  $240 = K(0.8)^0$   
 $240 = K \times 1 \quad \therefore K = 240$

(b) the value of  $B$  when  $t = 4$

$B = 240 \times (0.8)^4$   
 $= 98.3$

(c) the value of  $t$  when  $B = 100$

$100 = 240(0.8)^t$   
 $\frac{100}{240} = 0.8^t$   
 $\log_8 \frac{100}{240} = t \log_8 0.8$   
 $t = \frac{\log_8 \frac{100}{240}}{\log_8 0.8}$

2. Solve  $x^2 + (2x-4)^2 = 13$ .

$x^2 + 4x^2 - 16x + 16 - 13 = 0$   
 $5x^2 - 16x + 3 = 0$   
 $(5x-1)(x-3) = 0$   
 $x = \frac{1}{5}, 3$

$t = 3.92$

3. Solve the equation :

$\frac{20+3x}{x+2} = \frac{30+4x}{x+5}$   
 $(20+3x)(x+5) = (30+4x)(x+2)$   
 $20x + 100 + 3x^2 + 15x = 30x + 60 + 4x^2 + 8x$   
 $3x^2 + 35x + 100 = 4x^2 + 38x + 60$   
 $0 = x^2 + 3x - 40$   
 $0 = (x-5)(x+8)$   
 $x = 5, -8$

4. Solve  $3^{2x-1} = 50$

$(2x-1)\log 3 = \log 50$   
 $2x-1 = \frac{\log 50}{\log 3} = 3.56$   
 $2x = 4.56$   
 $x = 2.28$

5. Solve  $5-x = \frac{6}{x}$

$5x - x^2 = 6$   
 $0 = x^2 - 5x + 6$   
 $0 = (x-2)(x-3)$   
 $x = 2, 3$

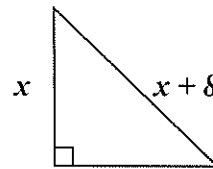
6. Solve:

$(x^2-81)(x^2-1) = 0$   
 $(x+9)(x-9)(x+1)(x-1) = 0$   
 $x = -9, 9, -1, 1$

7. Solve

$300(0.75)^t = 60$   
 $(0.75)^t = 0.2$   
 $t \log(0.75) = \log(0.2)$   
 $t = \frac{\log(0.2)}{\log(0.75)} = 5.59$

8. Find the sides of this triangle.



$(x+8)^2 = x^2 + (x+4)^2$   
 $x^2 + 16x + 64 = x^2 + x^2 + 8x + 16$   
 $0 = x^2 - 8x - 48$   
 $0 = (x-12)(x+4)$   
 $x$  must be 12 (it can't be -4)

**Calculus.**

1. If  $y' = x^2 - 8x + 15$  find  $y$  if  $x=3, y=2$

$y = \frac{x^3}{3} - 4x^2 + 15x + c$   
 Subst  $2 = 9 - 36 + 45 + c$   
 $-16 = c$   
 $y = \frac{x^3}{3} - 4x^2 + 15x - 16$

2. The velocity of a model car is:

$$v = 30t - 3t^2$$

(a) The distance  $x$  of the car from  $O$  initially is  $x = 4$  metres.

Find a formula for the distance at any time  $t$  sec

$$x = 15t^2 - t^3 + c$$

Sub  $t=0, x=4$  so  $c=4$

$$x = 15t^2 - t^3 + 4$$

(b) Find  $x$  at  $t=4$  sec

$$x = 15 \times 4^2 - 4^3 + 4$$

$$= 180 \text{ m}$$

(c) Find  $t$  when the velocity is zero.

$$t(30 - 3t) = 0$$

$$t = 0, 10 \text{ sec.}$$

(d) What is the maximum distance of the car from  $O$ ?

Max when  $t = 10$

$$x = 15 \times 10^2 - 10^3 + 4$$

$$= 504 \text{ m.}$$

3. If  $y' = x(x-2)(x-6)$   
find  $y$  if  $x=0, y=0$

$$y' = x(x^2 - 8x + 12)$$

$$= x^3 - 8x^2 + 12x$$

$$\text{so } y = \frac{x^4}{4} - \frac{8x^3}{3} + 6x^2 + c$$

Sub  $x=0, y=0$  so  $c=0$

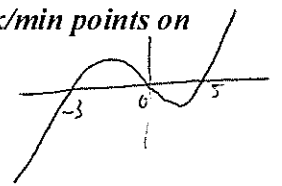
$$y = \frac{x^4}{4} - \frac{8x^3}{3} + 6x^2$$

4. Find the coordinates of the max/min points on the curve:

$$y = x(x+3)(x-5)$$

$$= x(x^2 - 2x - 15)$$

$$= x^3 - 2x^2 - 15x$$



$$y' = 3x^2 - 4x - 15 = 0 \text{ at max/min}$$

$$(3x + 5)(x - 3) = 0$$

$$x = -\frac{5}{3} \left. \begin{array}{l} \text{MAX} \\ y = 14.08 \end{array} \right\} \quad \text{MIN} \left\{ \begin{array}{l} x = 3 \\ y = -36 \end{array} \right.$$

5. Find the equation of the tangent to the curve  $y = x^2 - 3x + 2$  at the point  $(3, 2)$

$$y' = 2x - 3$$

$$\text{Sub } x = 3$$

$$y' = 3$$

eqn of tan is like  $y = mx + c$

$$\text{Sub } 2 = 3 \times 3 + c$$

$$2 = 9 + c$$

$$-7 = c$$

eqn of tan is

$$y = 3x - 7$$