Lesson 8

8.1 REVISION for the TEST

Marks Available : 64

Question 1

Write down the exact value of each of the following:

(i) 9^2 (ii) $(-2)^3$ (iii) $\left(\dfrac{1}{3}\right)^3$

(iv) $25^{\frac{1}{2}}$ (v) $27^{\frac{1}{3}}$ (vi) $(-1)^{18}$

(vii) $\left(\dfrac{2}{\pi}\right)^0$ (viii) 0^7 (ix) $\left(\dfrac{8}{11}\right)^2$

[9 marks]

Question 2

Consider the curve, $y = x^3 - 3x$

Write down the points on the curve that have the x part as given;

(i)   (2, _____)   (ii)   (10, _____)   (iii)   (-10, _____)

[3 marks]

Question 3

A quintic curve has equation, $y = 5x^5 - 7x^3$

(i)   Write down the gradient equation of the polynomial curve

[2 marks]

(ii)   Write down the bend detector equation of the polynomial curve

[1 mark]

(iii)   Use the appropriate equation to find the point on the curve when $x = 1$

[1 mark]

(iv)   Use the appropriate equation to find the gradient of the curve when $x = 1$

[1 mark]

(v)   Determine, when $x = 1$, if the curve is bending anticlockwise or clockwise

[2 marks]

Question 4

Write down the exact value of the following:

(i) 4^{-2} (ii) $8^{\frac{2}{3}}$

[2 marks]

Question 5

A curve has equation, $y = x^3 - 3x$

(i) Find $\dfrac{dy}{dx}$

[2 marks]

(ii) Find the gradient of the curve at the point where $x = -4$

[1 mark]

(iii) The curve has two turning points.
Find the coordinates of the two turning points.

[4 marks]

Question 6

Differentiate the following;

(i) $y = 5x^{-3}$

[2 marks]

(ii) $y = (5x + 3)^2$

[3 marks]

Some Theory of Mechanics

Starting with a displacement, *s*

Differentiate the displacement to get the velocity...

$$velocity = \frac{ds}{dt}$$

Differentiate the velocity to get the acceleration...

$$acceleration = \frac{d^2s}{dt^2}$$

Question 7

GCSE Examination question from May 2008, 4H, Q19
A particle moves in a straight line through a fixed point *O*.
The displacement of the particle from *O* at time *t* seconds is *s* metres, where

$$s = t^2 - 6t + 10$$

(**a**)   Find $\dfrac{ds}{dt}$

[**2 marks**]

(**b**)   Find the velocity of the particle when $t = 5$ s

[**2 marks**]

(**c**)   Find the acceleration of the particle.

[**2 marks**]

Question 8

GCSE Examination question from November 2007, 4H, Q20.

A curve has equation, $y = x^3 - 5x^2 + 8x - 7$

(a)   Find the gradient of the curve at $(2, -3)$

[**4 marks**]

(b)   What does your answer to part (a) tell you about
the point $(2, -3)$?

[**1 mark**]

Question 9

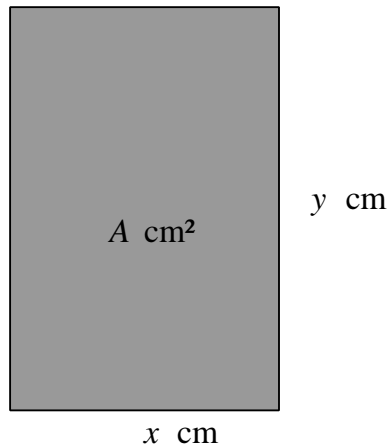**(i)**   Find the gradient equation of the curve,

$$y = \frac{16}{x^3}$$

[**3 marks**]

(ii)   Find the gradient of the curve when $x = -2$

[**2 marks**]

Question 10

GCSE Examination question from January 2012, 3H, Q14

y cm

A cm²

x cm

The diagram shows a rectangular photo frame of area A cm²

The width of the photo frame is x cm

The height of the photo frame is y cm

The perimeter of the photo frame is 72 cm

(a) Show that $A = 36x - x^2$

[**3 marks**]

(b) Find $\dfrac{dA}{dx}$

[**2 marks**]

(c) Find the maximum value of A

[**3 marks**]

Question 11

GCSE Examination question from November 2009, 4H, Q19.

A particle moves in a straight line through a fixed point O.

The displacement, s metres, of the particle from O at time t seconds is given by

$$s = t^3 - 5t^2 + 8$$

(a)   Find an expression for the velocity, v ms^{-1}, of the particle after t seconds.

[2 marks]

(b)   Find the time at which the acceleration of the particle is 20 ms^{-2}

[2 marks]

Question 12

Find the derivative of, $y = 18\sqrt{x}$

[3 marks]