9. Differentiation

Name:	Class:	Date:

Mark	/ 15	%

1) Find the set of values of x for which $f(x)$ is an increasing function. [2]

a) $f(x) = 2x^2 - 5x - 1$

b) $f(x) = 2x^3 - 21x^2 + 72x - 7$

2) Find the set of values of x for which $f(x)$ is a decreasing function. [1]

$f(x) = 9x + 8x^2 + 8$

3) Find the set of values of x for which $f(x)$ is an decreasing function. [1]

$f(x) = 2x^3 + 15x^2 + 24x - 9$

4) Find the least value of the following equation. [1]

$f(x) = 7x^2 + 14x + 8$

5) Find the greatest value of the following equation. [1]

$f(x) = 3 - 12x - 6x^2$

6) Find the least or greatest value of the following equation. [1]

$f(x) = 6 + 12x - 6x^2$

7) Find the coordinates of the turning point of the following equation and state whether it is a minimum or maximum.

[2]

a) $f(x) = 3 - 12x - 3x^2$

b) $y = 2x + 24\sqrt{x}$

8) Find the coordinates of the turning point of the following equation [2]

a) $y = x^3 + 3x^2 - 9x + 8$

b) $y = 16x + \frac{9}{x}$

9) A minor sector MON of a circle with centre O and radius r cm, has a perimeter of 324 cm and an area of A cm ^{2}.

a) Find an expression for the area of the sector, A, in terms of r in its simplest form.
b) Given that r varies, find the value of r for which A is a maximum.
c) Find the maximum area of the sector MON.

[1]

10) A large tank in the shape of a cuboid is to be made from 600 m ^{2} of sheet metal. The tank has a horizontal base and no top. The height of the tank is x metres. Two of the opposite vertical faces are squares.

a) Find an expression for the volume, V, in terms of x in its simplest form.
b) Given that x varies, find the value of x for which V is a maximum.
c) Find the maximum volume of the tank.

[1]

11) A rectangular garden is fenced on three sides with the house forming the fourth side of the rectangle. Given that the total length of the fence is 88 m and x represents the distance from the house to the end of the garden.

a) Find an expression for the area of the garden, A, in terms of x in its simplest form.
b) Given that x varies, find the value of x for which A is a maximum.
c) Find the maximum area of the garden.

[1]

12) A closed cylinder has total surface area of 150π. [1]

a) Find an expression for the volume, V cm^3, in terms of r in its simplest form.
b) Given that r varies, find the value of r for which V is a maximum.
c) Find the maximum volume of the tank.

Solutions for the assessment 9. Differentiation

1) a) $x > \frac{5}{4}$

b) $x < 3,\ x > 4$

2) $x < -\frac{9}{16}$

3) $-4 < x < -1$

4) The least value is 1

5) The greatest value is 9

6) The greatest value is 12

7) a) The coordinates are $(-2,\ 15)$ and it is a maximum point

b) The coordinates are $(36,\ 216)$ and it is a maximum point

8) a) Minimum coordinates are $(1,\ 3)$ and maximum are $(-3,\ 35)$

b) Minimum coordinates are $\left(\frac{9}{16},\ 25\right)$ and maximum are $\left(-\frac{9}{16},\ -25\right)$

9) a) A = $162r - r^2$ b) r = 81 cm c) A = 6561 cm ^{2}

10) a) V = $200x - \frac{2x^3}{3}$ b) x = 10 m c) V = 1333 m ^{3}

11) a) A = $88x - 2x^2$ b) = 22 m c) A = 968 m ^{2}

12) a) V = $75\pi r - \pi r^3$ b) = 5 cm c) V = 250 π cm ^{3}