

1 Find the set of values of the constant k for which the quadratic equation

$$3kx^2 + (k+8)x + 3 = 0$$

has two distinct real roots.

[4]

5 (a) Show that $\tan^4 \theta - 1 \equiv \frac{1 - 2 \cos \theta}{\cos^4 \theta}$.

[3]

(b) Hence solve the equation $\cos^2 \theta (\tan^4 \theta - 1) = 7$ for $0^\circ < \theta < 180^\circ$.

[4]

7

$$g(x) = 2x - 5 \quad \text{for } x \in \mathbb{R}.$$

- [1]

A diagram of a circular sector AOB. The center is O. The radius OA is labeled $r \text{ cm}$. The radius OB is labeled $r \text{ cm}$. The angle AOB is labeled $\frac{2}{3}\pi \text{ rad}$. The sector is shaded grey.

(a) Show that the area of the shaded region is approximately $0.614r^2 \text{ cm}^2$. [2]

- [2]

- [4]

It is given that the radius of the circle is increasing at a rate of 0.4 cm s^{-1} .

- (b) (i) Find the rate of increase of the area of the shaded region at the instant when $r = 20$.
Give your answer correct to 2 significant figures. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (ii) Find the rate of increase of the length of the arc AB . Give your answer correct to 2 significant figures. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 10 A circle has equation $x^2 + y^2 + 4y - 21 = 0$ and a straight line has equation $2x + y - 8 = 0$.
The line intersects the circle at two points.

- (a) Find the coordinates of these two points of intersection. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[3]

7