Additional Mathematics
Grade Gobbler 6

40 Mark Paper

Question 1

Differentiate, $y = 5x^3 + \frac{4}{x^2}$

[3 marks]

Question 2

A function, f, is given by, $f(x) = x^3 + kx^2 + 3x - 10$

It is known that $(x - 1)$ is a factor of $f(x)$

(i) Determine the value of k.

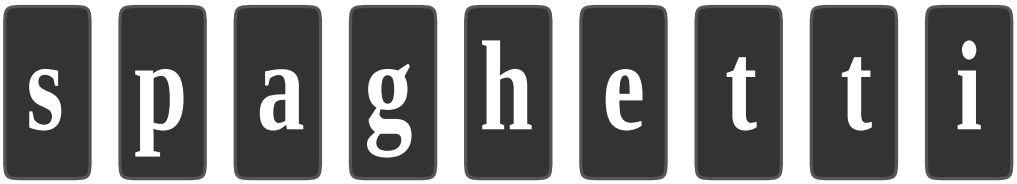
[1 mark]

(ii) Find, in terms of x, two more factors of $f(x)$

[3 marks]

Question 3

One letter is chosen at random from the word;



It is replaced, and then a second letter is chosen, again at random.
This process is repeated ten times in total.

Use the Binomial Theorem formula;

$$P(X = r) = {}^{n}C_r \, p^r \, q^{n-r} \qquad \text{(where } r = 0, 1, 2, ..., n\text{)}$$

to calculate the probability that exactly four of the ten choices are the letter "**t**"

[4 marks]

Question 4

A triangle has sides of lengths 4 cm, 7 cm and 10 cm
Find the size of the largest angle in the triangle.
Give your answer in degrees and accurate to one decimal place.

[3 marks]

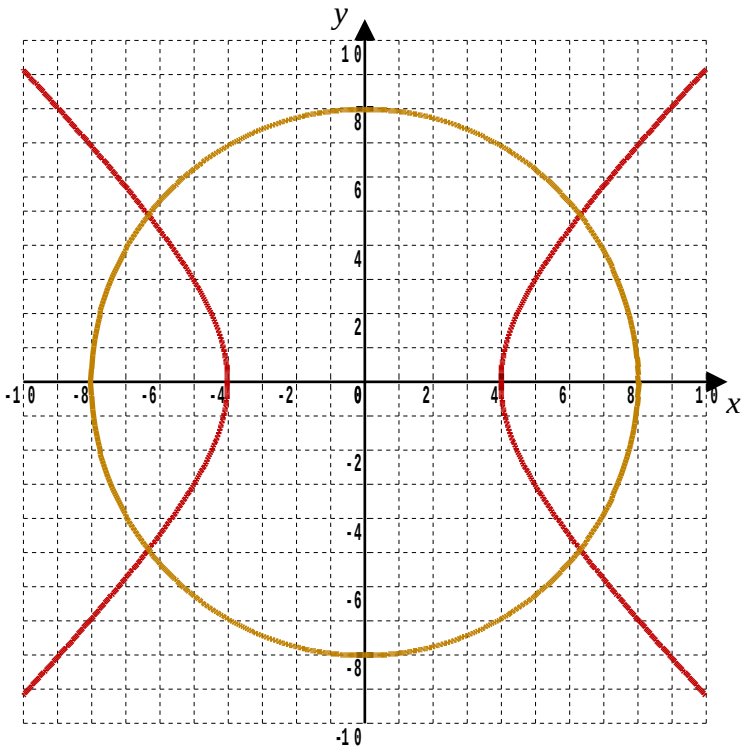
Question 5

Use integration to find the exact area bounded by the x-axis, the line $x = 1$, the line $x = 4$, and the curve $y = x^2 + 4$

[3 marks]

Question 6

The graph below is of the hyperbola, $x^2 - y^2 = 16$ and circle, $x^2 + y^2 = 64$



It can be seen from the graphs that the hyperbola and circle intersect at four points. Find the coordinates of these points of intersection.

[4 marks]

Question 7

Find all solutions in the interval $0° \leqslant x \leqslant 360°$ to the equation;

$$2\cos^2 x - 3\sin x = 3$$

[6 marks]

Question 8

Find an expression for $f^{-1}(x)$, given that $f(x) = \dfrac{4x + 5}{3}$

[3 marks]

Question 9

An truck moves with constant acceleration along a straight horizontal road.
The truck passes the point *A* with speed 5 m s^{-1}
It passes the point *B* 4 seconds later.
AB = 50 m

(a) Determine the acceleration of the truck.

[3 marks]

When the car passes the point *C*, it has speed 30 m s^{-1}

(b) Find the distance *AC*.

[3 marks]

Question 10

Find the equation of the tangent to the curve $y = x^3$ at the point $\left(\sqrt{2},\ 2\sqrt{2}\right)$.
Give your answer in the form $y = m\,x + k\sqrt{2}$ where *m*, and *k* are integers to be found.

[4 marks]