1) The line $y = mx + 4$ where $m > 0$ is the normal to the curve $y = 6 - x^2$ at the point (p,q). What is the value of p?

A $\frac{\sqrt{2}}{6}$ B $-\frac{\sqrt{2}}{6}$ C $\sqrt{\frac{3}{2}}$ D $\pm\sqrt{\frac{3}{2}}$ E $\sqrt{\frac{5}{2}}$

2) Find the shortest distance between the line $y = 2x - 1$ and the curve $y = x^2 + 5$

A 2 B $\sqrt{5}$ C $\sqrt{\frac{5}{2}}$ D 3 E 5

3) A line is drawn normal to the curve $y = \frac{2}{x}$ at the point where $x = 1$.

This line cuts the x-axis at P and y-axis at Q. Find the length of PQ.

A $\frac{3}{2}$ B $\frac{3}{2}\sqrt{5}$ C $\sqrt{\frac{15}{2}}$ D $2\sqrt{5}$ E 3

4) The line $y = mx + 2$ passes through the points $(5\ ,\ log_3 p)$ and $(log_3 p\ ,\ 2)$

What is the difference between the possible values of p?

A 8 B 3 C $\frac{2}{5}$ D 2 E 10

5) The line segment joining the points (2,2) and (6,8) is a diameter of a circle.

This circle is translated by 3 units in the positive x-direction, then reflected in the x-axis, and then enlarged by a scale factor of 2 about the centre of the resulting circle.

Find the equation of the final circle.

A $(x-7)^2 + (y-5)^2 = 26$ B $(x-7)^2 + (y+5)^2 = 26$

C $(x-1)^2 + (y-5)^2 = 52$ D $(x-1)^2 + (y+5)^2 = 52$

E $(x-7)^2 + (y+5)^2 = 52$ F $(x-1)^2 + (y-5)^2 = 26$

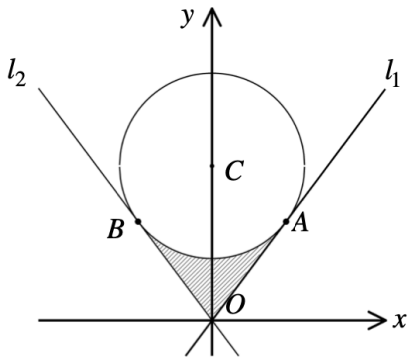
6) A point P lies on the curve with equation $x^2 + y^2 - 6x + 8y = 24$

What is the difference between the greatest and least possible values of the length OP, where O is the origin.

A 2 B 7 C 10 D 12 E 14

7) The diagram shows a circle with equation $x^2 + (y-4)^2 = 12$ and lines l_1 and l_2 which are tangents to the circle at A and B.

Find the area of the shaded region enclosed by the circle and the lines l_1 and l_2.

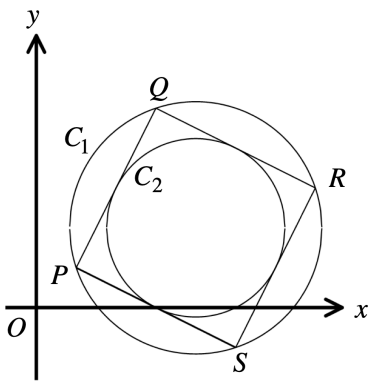


A $\pi - 2$ B $2\sqrt{3} - \pi$ C $\frac{3\pi}{2}$ D $4\sqrt{3} - 2\pi$ E $2\sqrt{3} + \pi$

8) The diagram shows a square PQRS with vertices at the points P (1,1), Q (3,5), R (7,3) S (5,-1).

The square is circumscribed by the circle C_1 and inscribed by the circle C_2

Find the area of the annulus between these two circles.



A $(\sqrt{10} - \sqrt{5})\pi$ B 2π C 5π D $\frac{5\pi}{2}$ E $\sqrt{5}\pi$

9) Find the area bounded by the graphs $y = \sqrt{2 - x^2}$ and $x + (\sqrt{2} - 1)y = \sqrt{2}$

(a) $\frac{\pi}{4} - \frac{1}{\sqrt{2}}$ (b) $\frac{sin\sqrt{2}}{\sqrt{2}}$ (c) $\frac{\pi}{2\sqrt{2}}$ (d) $\frac{\pi^2}{6}$

10) The lines given by the following equations are perpendicular.

$(1 + \sqrt{3})y = px + 5$ $y = (2 - \sqrt{3})x + 8$

What is the value of p ?

A $-5 - 3\sqrt{3}$

B $-5 + 3\sqrt{3}$

C $5 - 3\sqrt{3}$

D $5 + 3\sqrt{3}$

11) Let a and b be positive real numbers such that $a \leq b$
Given that $x^2 + y^2 \leq 1$ then the largest value that $ax + by$ can equal is:

A $a + b$

B b

C $\sqrt{a^2 + b^2}$

D $a^2 + ab + b^2$

E $\frac{1}{a} + \frac{1}{b}$