ADVANCED –ALGEBRA

PART A

1. Solve : $4 - 5x < 24$

A) $x < -4$ B) $x > 4$ C) $x > -4$ D) $x < 4$

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2. Which point lies on both $4x - 3y = 0$ and $x^2 + y^2 = 25$?

A) $(-3, 4)$ B) $(-3, -4)$ C) $(3, -4)$ D) $(6, 8)$

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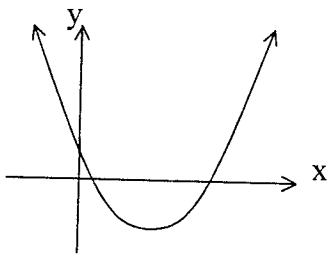
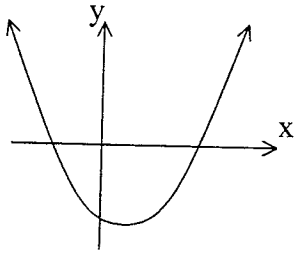
3. Which of the following could be the graph of $y = x^2 + 4x + 2$?

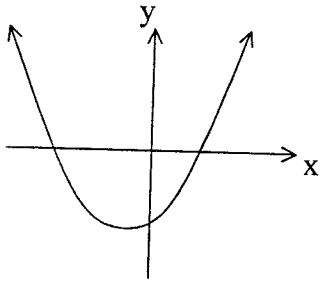
A)



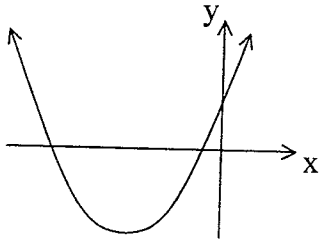
B)



C)



D)



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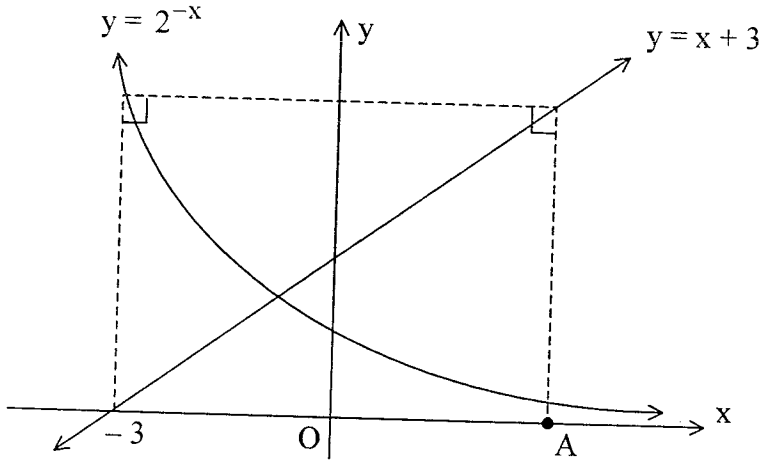
4. What are the coordinates of A?

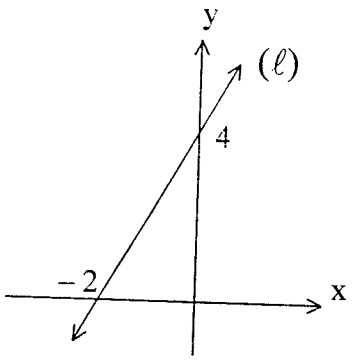


NOT TO SCALE

A) (6, 0) B) (4, 0) C) (3, 0) D) (5, 0)

PART B

5.



NOT TO SCALE

Find the equation of line (ℓ).

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6. Solve for y the following simultaneous equations

$$\begin{cases} x + 1 = 3y \\ x = 4y - 1 \end{cases}$$

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7. Solve the equation $x^2 = 4x$.

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8. Simplify $\dfrac{2}{x+1} \times \dfrac{x^2 + x}{4}$

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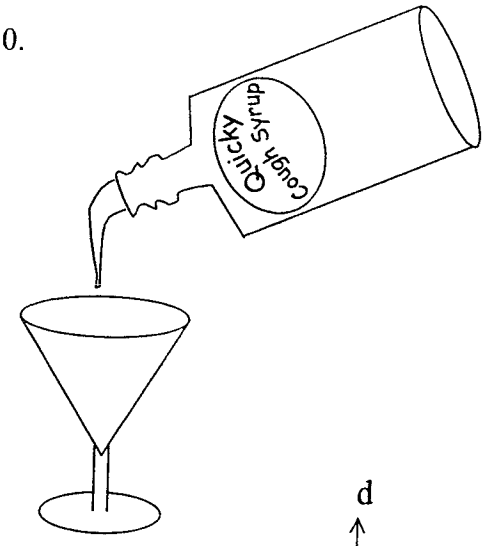
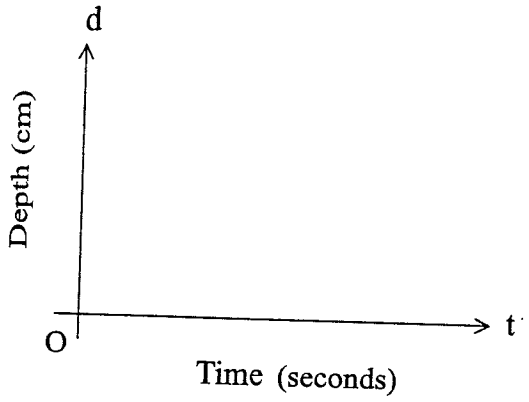
9. Make z the subject of $\dfrac{1}{z} = \dfrac{1}{x} + \dfrac{1}{y}$

10.



The diagram shows a measurement cup being filled with a cough syrup.

On the axes provided, sketch a graph that represents the changing depth of the medicine as the cup is being filled.



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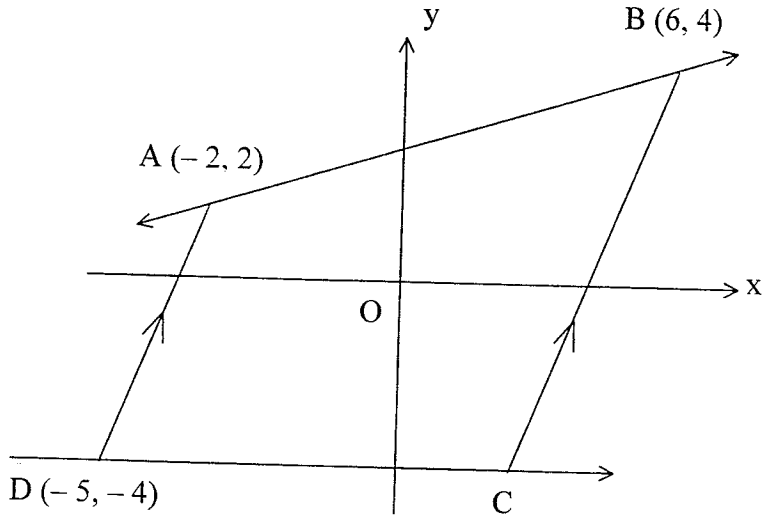
11. If $y^6 + (y+2)^4 + 2 = 322$ when $y = 2$, what value of y makes $(y-2)^6 + y^4 = 320$ true?

QUESTION 12 (3 marks)

ABCD is a trapezium. DA is parallel to CB and DC is parallel to the x axis.



NOT TO SCALE

a) Find the gradient of the line AD.

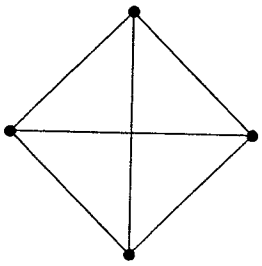
b) Find the equation of the line BC.

c) Find the coordinates of the point C.

QUESTION 13 (3 marks)

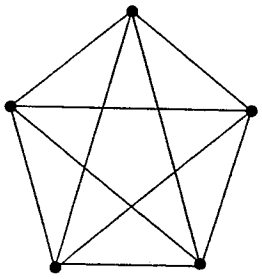
Vanessa wants to find the number of diagonals in a polygon of n sides. The diagram shows the number of diagonals in a quadrilateral, pentagon and hexagon.

Quadrilateral



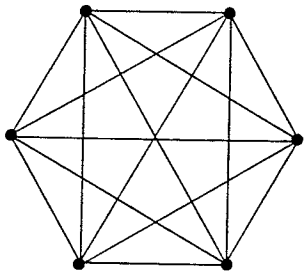
2 diagonals

Pentagon



5 diagonals

Hexagon



9 diagonals

She realises that the number of diagonals D in a polygon with N sides can be obtained by the formula $D = \frac{N^2 - 3N}{2}$, where N represents the number of sides.

a) Find the number of diagonals in an octagon.

b) If Vanessa counts 90 diagonals in a polygon, how many sides must this polygon have?

c) Vanessa counts $\frac{p^2 - 3p}{2}$ diagonals in a polygon with p sides. How many *more* diagonals can be counted in a polygon with (p + 1) sides?

Formulae

Simple interest = PRT where $R = \frac{r}{100}$

Amount (compound interest) = $P(1+R)^n$ where $R = \frac{r}{100}$

Circumference of a circle = πd

Area of a circle = πr^2

Surface area of a cylinder = $2\pi r^2 + 2\pi rh$

Surface area of a sphere = $4\pi r^2$

Curved surface area of cone = πrs where s = slant height

Volume of prism = Ah

Volume of a pyramid or a cone = $\frac{1}{3}Ah$

Volume of a sphere = $\frac{4}{3}\pi r^3$

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$, $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Area of triangle = $\frac{1}{2}ab\sin C$

Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Exact value triangles: