Section One: Calculator-free **36% (54 Marks)**

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1 **(6 marks)**

(a) A circle of radius 3 has its centre at the point $(4, -2)$.

(i) State the domain of this relation. (1 mark)

(ii) Determine the equation of the circle in the form $x^2 + y^2 = ax + by + c$. (3 marks)

(b) The graph of $x = y^2$ passes through the point $(1, q)$. Determine the value(s) of q and hence explain why y is a relation but not a function of x. (2 marks)

Question 2 **(7 marks)**

Solve the following equations for x.

(a) $(4x - 7)(x + 5) = 0$. (1 mark)

(b) $\frac{x}{4} = \frac{3x - 2}{3}$. (2 marks)

(c) $6x = 3x^2$. (2 marks)

(d) $x^2 + 4x - 11 = 0$ (2 marks)

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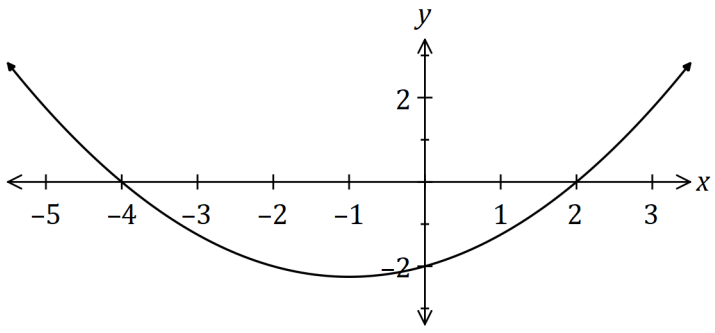
Question 3 **(8 marks)**

(a) Determine the coordinates of the

(i) y-intercept of the graph of $y = -2(x + 4)^2 + 12$. (2 marks)

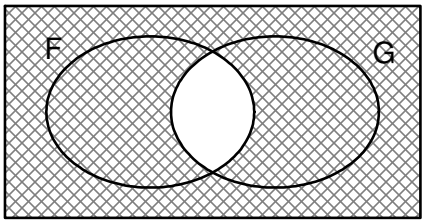
(ii) turning point of the graph of $y = (x - 3)(x + 1)$. (2 marks)

(b) The graph of $y = ax^2 + bx + c$ is shown below. Determine the value of the coefficients a, b and c. (4 marks)

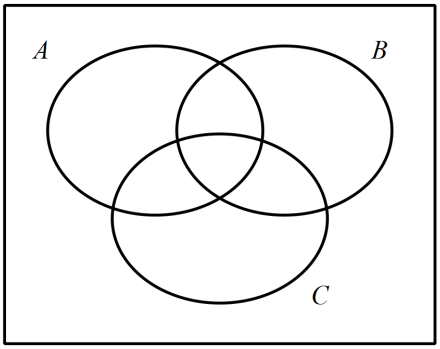


Question 4 **(7 marks)**

(a) Use set notation to describe the shaded region shown below. (1 mark)



(b) Hence or otherwise, shade $(\overline{A} \cup \overline{B}) \cap \overline{C}$ (1 mark)



(c) 64 people applied for a job, of whom 38 were female and 41 had experience in a similar job. The number of females with experience was four times the number of males with no experience.

Determine

(i) the number of females with no experience. (3 marks)

(ii) the probability that a randomly chosen applicant had no experience, given that they are male. (2 marks)

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Question 5 **(8 marks)**

(a) Briefly describe the behaviour of y for each of the following graphs, given the behaviour of x :

(i) $y = x^5$, as $x \to -\infty$. (1 mark)

(ii) $y = \frac{1}{x}$, as $x \to \infty$. (1 mark)

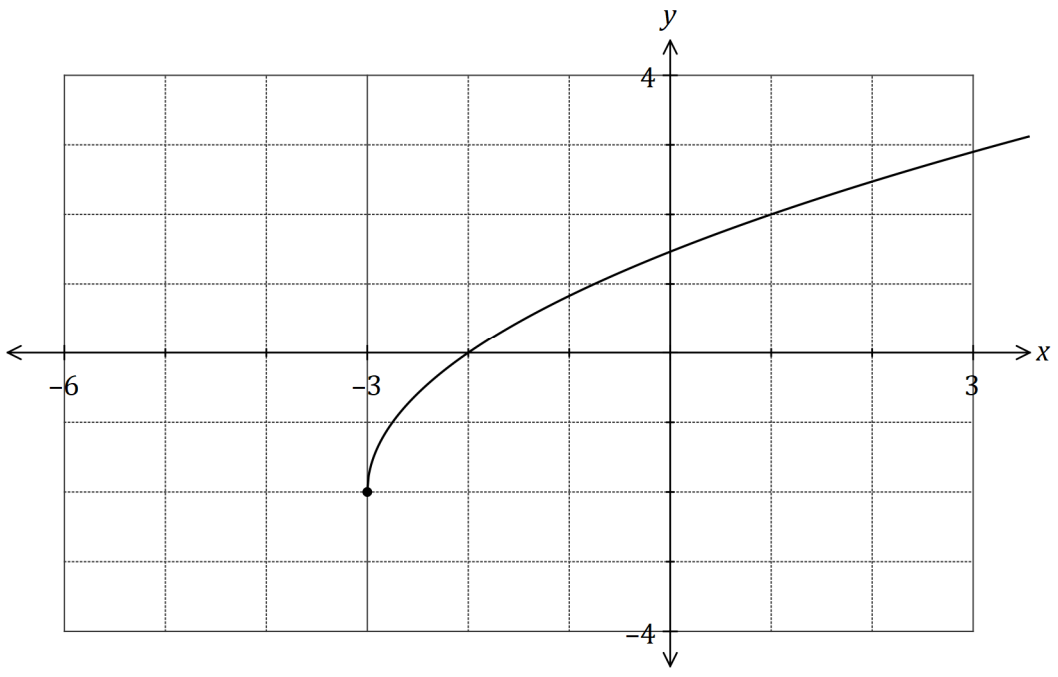
(iii) $y = (1 - 2x)^2$, as $x \to \infty$. (1 mark)

(b) The graph of $y = f(x)$ is shown below.

(i) Determine the equation of *f(x)* in the form $y = 2\sqrt{x + c} - d$ (2 marks)

(ii) State the range of *f(x).* (1 mark)

(ii) Graph $y = f(2x)$ on the same set of axes. (2 marks)



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Question 6 **(6 marks)**

Let $f(x) = x^3 + 2x^2 - 11x - 12$.

(a) Identify the leading coefficient of *f(x).* (1 mark)

(b) Determine $f(-1)$. (1 mark)

(c) Solve $f(x) = 0$. (4 marks)

Question 7 **(7 marks)**

(a) Expand $(x + 5)^3$ (2 marks)

(b) Complete the row of Pascal's triangle that starts $1, 5, 10, \ldots$ and express the sum of the numbers in this row as a power of 2. (1 mark)

(c) Hence, determine the coefficient of

(i) the x^4 term in the expansion of $(x + 1)^5$. (1 mark)

(ii) the x^3 term in the expansion of $(2 - 3x)^5$. (3 marks)

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Question 8 **(5 marks)**

(a) Evaluate $\sin\left(\frac{35\pi}{42}\right)$. (2 marks)

(b) An acute angle A exists such that $\cos A = \frac{1}{3}$. Show that $\sin A = \frac{2\sqrt{2}}{3}$ and hence, determine the value of $\tan A$. (3 marks)

End of questions

Supplementary page

Question number: _____

Supplementary page

Question number: _____