

Section 1- Surds (17 marks)

1. Evaluate

a. $\sqrt{49}$

b. $\sqrt[3]{8}$

2. Simplify

a. $\sqrt{7} \times \sqrt{7}$

b. $(\sqrt{2})^5$

c. $\frac{\sqrt{32}}{\sqrt{2}}$

3. Express in the form $k\sqrt{2}$

a. $\sqrt{18}$

4. Simplify

a. $\sqrt{12}$

b. $\sqrt{45}$

c. $\sqrt{216}$

5. Simplify

a. $\sqrt{18} + \sqrt{50}$

b. $\sqrt{360} - 2\sqrt{40}$

6. Express in the form $a + b\sqrt{3}$

a. $\sqrt{3}(2 + \sqrt{3})$

b. $(4 + \sqrt{3})(1 + 2\sqrt{3})$

7. Simplify

a. $(\sqrt{5} + 1)(2\sqrt{5} + 3)$

b. $(3\sqrt{2} - 1)(2\sqrt{2} + 5)$

8. Rationalise the denominator

a. $\frac{1}{\sqrt{5}}$

b. $\frac{1}{3\sqrt{7}}$

Section 2 – Indices (19 marks)

1. Evaluate

a. 8^2

b. $\left(\frac{2}{3}\right)^3$

2. Write in the form 2^n

a. $2^5 \times 2^3$

3. Simplify

a. $2p^2 \times 4p^5$

b. $(2b)^3 \div 4b^2$

c. $6x^5 \div 3x^2y$

4. Evaluate

a. 3^{-2}

b. $16^{\frac{1}{4}}$

c. $81^{-\frac{1}{4}}$

5. Evaluate

a. $4^{\frac{3}{2}}$

b. $36^{-\frac{3}{2}}$

c. $(0.04)^{\frac{1}{2}}$

6. Work out

a. $4^{\frac{1}{2}} \times 27^{\frac{1}{3}}$

b. $\left(\frac{1}{3}\right)^{-2} - (-8)^{\frac{1}{3}}$

c. $\left(\frac{1}{9}\right)^{-\frac{1}{2}} \times (-32)^{\frac{3}{5}}$

7. Simplify

a. $x^8 \times x^{-6}$

b. $y^3 \times y^{-\frac{1}{2}}$

c. $p^{\frac{1}{4}} \div p^{-\frac{1}{5}}$

d. $\frac{b^2 \times b^{\frac{1}{4}}}{b^{\frac{1}{2}}}$

Section 3 – Factorising (16 marks)

1. Using factorisation, solve

a. $x^2 - 4x + 3 = 0$

b. $x^2 - 25 = 0$

c. $60 - 4x - x^2 = 0$

d. $3x^2 + 11x = 4$

e. $4x^2 + 4x + 1 = 0$

2. Factorise fully

a. $2y^2 - 10y + 12$

b. $a^4 + 4a^2 + 3$

c. $6x^3 - 26x^2 + 8x$

3. Sketch each curve showing all intersection points

a. $y = x^2 - 3x + 2$

b. $y = x^2 - 2x$

c. $y = -x^2 + 5x - 4$

d. $y = 2x^2 + 13x + 6$

e. $y = 5x^2 - 17x + 6$

4. Solve

a. $x - 5 + \frac{4}{x} = 0$

b. $\frac{5}{x^2} + \frac{4}{x} - 1 = 0$

c. $4x^4 + 7x^2 = 2$

Section 4 – Completing the square (9 marks)

1. Express in the form $(x + a)^2 + b$

a. $x^2 + 2x + 4$

b. $x^2 + 4x + 8$

c. $x^2 + 6x - 9$

d. $x^2 - 18x + 100$

e. $5 - 3x + x^2$

2. Solve, in surd form by completing the square

a. $y^2 - 4y + 2 = 0$

b. $x^2 - 2x = 11$

c. $u^2 + 7u = 44$

d. $-m^2 + m + 1 = 0$

Section 5 – The Quadratic Formula (5 marks)

1. Use the quadratic formula to solve, leave your answers as surds

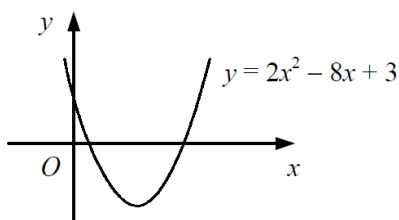
a. $x^2 + 4x + 1 = 0$

b. $6 + 18a + a^2 = 0$

c. $5 - y - y^2 = 0$

d. $0.1r^2 + 1.4r = 0.9$

2. The diagram shows the curve with equation $y = 2x^2 - 8x + 3$. Find and simplify the exact coordinates of the points where the curve crosses the x axis



Section 6 – Simultaneous Equations (3 marks)

1. Solve

a. $y = 3x$

$$y = 2x + 1$$

b. $x + y - 3 = 0$

$$x + 2y + 1 = 0$$

2. Find the coordinates of the points of intersection

$$y = x + 2$$

$$y = x^2 - 4$$

Section 7 – Inequalities (12 marks)

1. Find the set of values of x

a. $2x + 1 < 7$

b. $5x + 17 \geq 2$

c. $18 - x > 4$

2. Solve

a. $2y - 3 > y + 4$

b. $a + 11 \geq 15 - a$

c. $4x + 23 < x + 5$

d. $5(r - 2) > 30$

e. $7(y + 3) - 2(3y - 1) < 0$

3. Find the set of values of x

a. $x^2 - 4x + 3 < 0$

b. $x^2 - 6x + 5 > 0$

c. $63 - 2x - x^2 \leq 0$

4. Find the set of values of x in terms of surd

a. $x^2 + 2x - 1 < 0$

Section 8 – Algebraic Fractions (19 marks)

1. Simplify

a. $\frac{m}{16} \div \frac{5m}{12}$

b. $\frac{3m}{8} \div \frac{15m}{20}$

c. $\frac{6x+3}{8} \div \frac{2x+1}{12}$

d. $\frac{9xy}{7} \div \frac{6x}{3}$

e. $\frac{6pq}{5} \div \frac{12p}{7}$

f. $\frac{3(x+1)}{8} \div \frac{5(x+1)}{16}$

2. Simplify

a. $\frac{x}{3} + \frac{x}{4}$

b. $\frac{2}{2xy} + \frac{4}{xy^3}$

c. $\frac{3x+1}{2} - (6x + 5)$

d. $\frac{3}{b-1} - \frac{4}{b-2}$

e. $\frac{\frac{2x+2}{y}}{\frac{x+1}{xy}}$

3. Simplify

a. $\frac{4(x+1)}{3} - \frac{5(x-2)}{2}$

b. $\frac{x^2+3x}{x+4} \times \frac{2x+8}{5x}$

c. $\frac{8x-24}{4} \div \frac{x+7}{12}$

4. Solve

a. $\frac{x+8}{5} - \frac{x-2}{3} = 4$

b. $\frac{x+1}{3} + \frac{x-4}{2} = 5$

c. $\frac{3(x-2)}{4} - \frac{2(x+1)}{5} = \frac{1}{10}$

d. $\frac{4}{x+1} + \frac{3}{x-4} = \frac{2}{x+1}$

e. $\frac{5}{x+3} + \frac{2}{2x+6} = 4$

Section 9 – Graphs (16 marks)

1.

Describe how the graph of $y = f(x)$ is transformed to give the graph of

a $y = f(x - 1)$

b $y = f(x) - 3$

c $y = 2f(x)$

d $y = f(4x)$

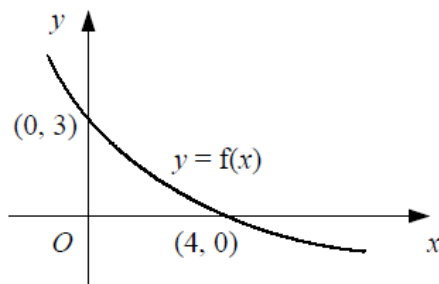
e $y = -f(x)$

f $y = \frac{1}{5}f(x)$

g $y = f(-x)$

h $y = f(\frac{2}{3}x)$

2.



The diagram shows the curve with equation $y = f(x)$ which crosses the coordinate axes at the points $(0, 3)$ and $(4, 0)$.

Showing the coordinates of any points of intersection with the axes, sketch on separate diagrams the graphs of

a $y = 3f(x)$

b $y = f(x + 4)$

c $y = -f(x)$

d $y = f(\frac{1}{2}x)$

3.

Find and simplify an equation of the graph obtained when

a the graph of $y = 2x + 5$ is translated by 1 unit in the positive y -direction,

b the graph of $y = 1 - 4x$ is stretched by a factor of 3 in the y -direction, about the x -axis,

c the graph of $y = 3x + 1$ is translated by 4 units in the negative x -direction,

d the graph of $y = 4x - 7$ is reflected in the x -axis.