

- 1 (i) Solve the equation $x^2 - 6x - 2 = 0$, giving your answers in simplified surd form. [3]
- (ii) Find the gradient of the curve $y = x^2 - 6x - 2$ at the point where $x = -5$. [2]



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2 Solve the equations

- (i) $3^n = 1$, [1]
- (ii) $t^{-3} = 64$, [2]
- (iii) $(8p^6)^{\frac{1}{3}} = 8$. [3]



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- 3 (i) Sketch the curve $y = (1+x)(2-x)(3+x)$, giving the coordinates of all points of intersection with the axes. [3]
- (ii) Describe the transformation that transforms the curve $y = (1+x)(2-x)(3+x)$ to the curve $y = (1-x)(2+x)(3-x)$. [2]



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- 4 (i) Solve the simultaneous equations
- $$y = 2x^2 - 3x - 5, \quad 10x + 2y + 11 = 0.$$
- [5]
- (ii) What can you deduce from the answer to part (i) about the curve $y = 2x^2 - 3x - 5$ and the line $10x + 2y + 11 = 0$? [1]



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- 5 (i) Simplify $(x+4)(5x-3) - 3(x-2)^2$. [3]
- (ii) The coefficient of x^2 in the expansion of
- $$(x+3)(x+k)(2x-5)$$
- is -3 . Find the value of the constant k . [3]



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- 6 (i) The line joining the points $(-2, 7)$ and $(-4, p)$ has gradient 4. Find the value of p . [3]
- (ii) The line segment joining the points $(-2, 7)$ and $(6, q)$ has mid-point $(m, 5)$. Find m and q . [3]
- (iii) The line segment joining the points $(-2, 7)$ and $(d, 3)$ has length $2\sqrt{13}$. Find the two possible values of d . [4]



7 Find $\frac{dy}{dx}$ in each of the following cases:

(i) $y = \frac{(3x)^2 \times x^4}{x}$, [3]

(ii) $y = \sqrt[3]{x}$, [3]

(iii) $y = \frac{1}{2x^3}$, [2]



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8 The quadratic equation $kx^2 + (3k - 1)x - 4 = 0$ has no real roots. Find the set of possible values of k . [7]



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9 A circle with centre C has equation $x^2 + y^2 - 2x + 10y - 19 = 0$.

(i) Find the coordinates of C and the radius of the circle. [3]

(ii) Verify that the point $(7, -2)$ lies on the circumference of the circle. [1]

(iii) Find the equation of the tangent to the circle at the point $(7, -2)$, giving your answer in the form $ax + by + c = 0$, where a , b and c are integers. [5]



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10 Find the coordinates of the points on the curve $y = \frac{1}{3}x^3 + \frac{9}{x}$ at which the tangent is parallel to the line $y = 8x + 3$. [10]

