

Answers

Clear, easy to follow, step-by-step worked solutions (54 pages) to this excellent Higher Maths resource is available in the **exam focused** Online Study Pack.

Higher Maths Study Pack

Straight Lines

(1) $y = -\frac{3}{2}x + \frac{5}{2}$

(2) $a = 116.6^\circ$

(3) $y = \frac{1}{2}x - 6$

(4) (a) $y = 2x - 15$ (b) $3y = -4x + 25$ (c) *Point of intersection (7, -1)*

(5) $y = 2x - 12$

Functions & Graphs

(6) (a) *$f(x)$ flipped in the x axis and shifted up 3 positions*

(b) *$f(x)$ flipped in the x axis, stretched by 3 in the vertical and shifted to the right 2 positions*

(7) (a) $g(f(x)) = x$ (b) *$f(x)$ and $g(x)$ are the inverse of each other*

(8) (a) $f(g(x)) = 9x^2 + 3x - 12$ (b) $x = -\frac{4}{3}$ or $x = -1$ (c) $x \neq -\frac{4}{3}$ or $x \neq 1$

Recurrence Relations

(9) (a) $n = 5$ for $u_n > 49$ (b) Since $-1 < 0.6 < 1$ there is a limit, $L = 50$

(10) $a = 0.75$, $b = 80$

(11) $u_1 = 60$ (12) $p = \frac{3q}{2}$

(13) (a) $U_{n+1} = 0.7U_n + 20$ (b) 65.88234 ml

(c) Yes, since the limit is $66\frac{2}{3} \text{ ml}$ and this is less than 70 ml

Differentiation

(14) $f'(4) = 3\frac{1}{16}$

(15) Rate of change = 19

(16) $y = 10x - 16$

(17) $y = -6x - 3$

(18) $\frac{dy}{dx} \geq 0$ therefore the curve is never decreasing

(19) $x < -2, x > 4$

(20) SP's $(0, 5)$ Falling point of inflexion and $(3, -22)$ Minimum TP

(21) Min = -45 , Max = 7

(22) $f'(x)$ is a parabola with a min TP cutting the x-axis at $(0, 0)$ & $(6, 0)$

Trigonometry

(23) (a) $x = 0.16, 1.73, 3.30, 4.87$ (radians)

(b) $x = 75^\circ, 135^\circ, 255^\circ, 315^\circ$ (degrees)

(c) $x = 19.5^\circ, 90^\circ, 160.5^\circ, 270^\circ$ (degrees)

(24) (a) $p = 2, q = 2, r = 3$ (b) A (138.6, 3.25) B (221.4, 3.25)

(25) (a) $\sin 2x = \frac{4}{5}$ (b) $\cos 2x = \frac{3}{5}$ (c) $\tan 2x = \frac{4}{3}$

(26) $\cos(x + y) = \frac{16}{65}$

Polynomials

(27) (a) Check remainder is zero (b) $(x - 1)(2x - 3)(x + 1)$

(28) $x = -1, x = -3, x = 2$

(29) $y = 2x(x - 4)^2$

(30) $x = -3, x = \frac{5}{2}, x = 2$

(31) $p = 16, q = 32$

Quadratic Theory

(32) (a) $f(x) = 3(x + 2)^2 - 14$ (b) Minimum TP at $(-2, -14)$

(33) (a) since $b^2 - 4ac > 0$ roots are real and distinct

(b) since $b^2 - 4ac < 0$ there are no real roots

(34) (a) $k = 5$ (b) $k > 2$ and $k < -6$

(35) find $\frac{dy}{dx}$ first and since $b^2 - 4ac < 0$ there are no real roots and no SP's

Integration

(36) (a) $\frac{x^2}{2} + \frac{1}{x} + C$ (b) $-\frac{49}{10}$

(37) $y = x^3 - 2x^2 + x + 6$

(38) Area = 108 unit^2

(39) (a) Area = $20\frac{5}{6} \text{ unit}^2$ (b) Area = 9 unit^2

Circles

(40) $y = 2x + 8$

(41) (a) A $(-2, -6)$ B $(8, 4)$ (b) $(x - 3)^2 + (y + 1)^2 = 50$

(42) Since there is only one point of contact at $(-2, 2)$ then the line

is a tangent to the circle

(43) Equation of the larger circle is $(x - 8)^2 + (y - 1)^2 = 49$