Half Term 6 (ANSWERS)	Week 1
1	*$(x - 2)^2 + (y - 3)^2 = 25$* *Centre (2,3)* *$y = 0$* *$(x - 2)^2 + 9 = 25$* *$x^2 - 4x - 12 = 0$* *$x = 6$ or $x = -2$* *$x = 6 \;\; y = 0$* *Gradient of normal $= -\frac{3}{4}$* *Gradient of tangent $= \frac{4}{3}$* *$3y = 4x - 24$*
2	$y = 4x^{\frac{3}{2}} + \frac{1}{2}x^{-\frac{1}{2}}$ $\frac{dy}{dx} = 6\sqrt{x} + \frac{1}{4\sqrt{x^3}}$
3	$(x + 3)^2 - 9 + 16$ $(x + 3)^2 + 7$ *Greatest value* $= \frac{1}{7}$
4	*(-4,4) to (2,6) Gradient* $= \frac{1}{3}$ *(2,6) to (6,-6) Gradient* $= -3$ *Perpendicular* *Area* $= \frac{1}{2}\left(\sqrt{6^2 + 2^2} \times \sqrt{4^2 + 12^2}\right)$ *= 40 units²*
5	$2^4 \times (-3x^3) + 2 \times {}_4C_3 \times 2 \times (3x)^3$ $= 384\,x^3$

Half Term 6 (ANSWERS)	Week 2

1	$(-k)^2 - 4 \times 4 \times (k-3) \geq 0$ $k^2 - 16k + 48 \geq 0$ $k \leq 4 \quad or\ k \geq 12$
2	$cos^2\theta = \left(\sqrt{2} - 1\right)^2$ $= 3 - 2\sqrt{2}$ $sin^2\theta = 1 - cos^2\theta$ $= 1 - (3 - 2\sqrt{2})$ $= 2\sqrt{2} - 2$
3	$x = 1 \ \ y = 5 \quad A\,(1,\ 5)$ $\frac{dy}{dx} = 1 - \frac{4}{x^2} \quad x = 1 \quad \frac{dy}{dx} = -3$ *Gradient of normal at A is* $\frac{1}{3}$ *Equation of the normal* $(y - 5) = \frac{1}{3}(x - 1)$ $3y = x + 14$ $y = 0 \quad x = -14$
4	$log_a \frac{n^2}{3-n} = log_a 4$ $\frac{n^2}{3-n} = 4$ $n^2 + 4n - 12 = 0$ $n = 2$ *($n = -6$ not possible)*
5	$\left(\frac{1}{2}\right)^x = 2^{-x}$ *Reflection in the y - axis*

Half Term 6 (ANSWERS)	Week 3
1	$4y = 6x + 2 \quad 4y^2 = 9x^2 + 6x + 1$ $9x^2 - 9x^2 - 6x - 1 + 9x - 6x - 2 = 1$ $-3x = 4$ $x = -\frac{4}{3} \quad y = -\frac{3}{2}$
2	$y = \frac{(x-3)^2}{3\sqrt{x}}$ $= \frac{x^2-6x+9}{3\sqrt{x}}$ $Y = \frac{1}{3}x^{\frac{3}{2}} - 2x^{\frac{1}{2}} + 3x^{-\frac{1}{2}}$ $\frac{dy}{dx} = \frac{1}{2}\sqrt{x} - \frac{1}{\sqrt{x}} - \frac{3}{2\sqrt{x^3}}$
3	$9^x - 3(3^{x+1}) = 0$ $3^{2x} - 3(3^x \times 3) = 0$ $3^{2x} - 9(3^x) = 0$ Let $y = 3^x \quad y^2 - 9y = 0$ $y(y - 9) = 0 y = 0$ and $y = 9$ $3^x = 0$ or $3^x = 9$ $x = 2$
4	$\sin x = 1 - 2(1 - \sin^2 x)$ $2\sin^2 x - \sin x - 1 = 0$ $\sin x = 1$ or $\sin x = -½$ $x = 90^0, 210^0, 330^0$
5	$4x - x^2 = 0$ $x = 0$ or $x = 4$ $\int_0^4 4x - x^2 dx = \left[2x^2 - \frac{1}{3}x^3\right]$ $= 10\frac{2}{3}$

Half Term 6 (ANSWERS)	Week 4

1	$(x - 4)^2 + (y - 3)^2 = 5$ Centre (4,3) Gradient of normal = - ½ Gradient of the tangent = 2 $y - 4 = 2(x - 2)$ $y = 2x$
2	$2^8 + 8 \times 2^7 \times (-3x) + 28 \times 2^6 \times (-3x)^2$ $256 - 3072x + 16128x^2$
3	$f(x) = (x + 3)(x + 4)(x - 1)$
4	$\overrightarrow{AB} = 6i + 3j$ $\lvert\overrightarrow{AB}\rvert = \sqrt{6^2 + 3^2}$ $= 3\sqrt{5}$
5	$t = 0 \quad 20 = Ae^0$ $A = 20$ $t = 5 \quad M = 10$ $10 = 20e^{-5k}$ $e^{-5k} = 0.5$ $-5k = \ln(0.5) \quad k = 0.139$

Half Term 6 (ANSWERS)	Week 5

1	$(2^{-3})^{2x} = (2^4)^{3x-1}$ $-6x = 4(3x - 1)$ $x = \frac{2}{9}$
2	$x^2 + 1 = 10$ $x = \pm 3$ $\int_{-3}^{3} 10 - x^2 - 1 \, dx = \left[9x - \frac{1}{3}x^3\right]$ $= 36$
3	$2\theta = (-45^0), 135^0, 315^0, 495^0, 675^0$ $\theta = 67.5^0, 157.5^0, 247.5^0, 337.5^0$
4	$y = x + 4 + \frac{4}{x} \quad x = 1 \quad y = 9$ $\frac{dy}{dx} = 1 - \frac{4}{x^2}$ Gradient of tangent = -3 Gradient of the normal $= \frac{1}{3}$ $y - 9 = \frac{1}{3}(x - 1) \quad 3y = x + 26$
5	$x \times {}_7C_3 \times (2x)^3 - 4 \times {}_7C_4 \times (2x)^4$ $-1960 x^4$

Half Term 6 (ANSWERS)	Week 6

1	$\sqrt{13^2 - 5^2} = 12$ $\quad cos\theta = \frac{12}{13}$
2	$log_4(n(n+6)) = log_4 16$ $n^2 + 6n = 16$ $n^2 + 6n - 16 = 0$ $(n+8)(n-2) = 0$ $n = -8$ (no solution) $n = 2$
3	$\frac{(3+\sqrt{2})(\sqrt{2}-1)}{(\sqrt{2}+1)(\sqrt{2}-1)} - \frac{(1+\sqrt{2})}{(1-\sqrt{2})(1+\sqrt{2})}$ $-1 + 2\sqrt{2} - (-1 - \sqrt{2})$ $= 3\sqrt{2}$
4	$\frac{dy}{dx} = 3x^2 + 6x$ $\quad \frac{d^2y}{dx^2} = 6x + 6$ $3x^2 + 6x = 0$ $3x(x+2) = 0$ $x = 0$ or $x = -2$ $\quad x = 0 \quad \frac{d^2y}{dx^2} > 0$ minimum $(0, 72)$
5	$y = \int 3 + \frac{12}{x^4}\, dx = 3x - \frac{4}{x^3} + c$ $x = 1, y = 1$ $3 - \frac{4}{1} + c = 1$ $c = 2$ $f(x) = 3x - \frac{4}{x^3} + 2$

Half Term 6 (ANSWERS)	Week 7
1	$4(1-cos^2\theta)-2=7cos\theta$ $2-4cos^2\theta=7cos\theta$ $4cos^2\theta+7cos\theta-2=0$ $cos\theta=\frac{1}{4}$ $\quad cos\theta=-2$ (no solutions) $\theta=-75.5°, 75.5°$
2	$x^2+2=2x+5$ $x^2-2x-3=0$ $(x-3)(x+1)=0$ $x=-1$ and $x=3$ $\int_{-1}^{3}(2x+5-x^2-2)dx=\left[x^2+3x-\frac{1}{3}x^3\right]=9-(-1\frac{2}{3})=10\frac{2}{3}$
3	$\lvert 2i-4j\rvert=\sqrt{2^2+4^2}$ $=\sqrt{20}$ $2\sqrt{5}i-4\sqrt{5}$
4	$e^{2x-2}=20$ $2x-2=\ln 20$ $x=\frac{\ln 20+2}{2}$ $x=2.498$
5	$(x+2)^2+(y-2)^3-8=24$ *Centre of the circle (-2, 2)* *Gradient of the normal = -1* *Gradient of the tangent = 1* $\quad y+2=x-2$ $y=x-4$