Half Term 2A (ANSWERS)	Week 1

1	1^{st} *term* $= 5$ 2^{nd} *term* $= 8$ $S_{10} = \frac{10}{2}\left(2 \times 5 + 3(10-1)\right)$ $= 185$
2	$u = 4x^2 - x^3 \qquad y = u^4$ $\frac{du}{dx} = 8x - 3x^2 \qquad \frac{dy}{du} = 4u^3$ $\frac{dy}{dx} = 4(8x - 3x^2)(4x^2 - x^3)^3$
3	$(1+2x)^{-2}$ $= 1 - 2(2x) + \frac{(-2)(-3)}{2!}(2x)^2 + \frac{(-2)(-3)(-4)}{3!}(2x)^3$ $= 1 - 4x + 12x^2 - 32x^3$
4	$sin^2\theta = \frac{3}{4}$ $sin\theta = \pm\frac{\sqrt{3}}{2}$ $\theta = -\frac{2\pi}{3}, -\frac{\pi}{3}, \frac{\pi}{3}, \frac{2\pi}{3}$
5	$\int_{-1}^{3} 3x^2 - 6x + 7\, dx = [x^3 - 3x^2 + 7x]$ $(3^3 - 3 \times 3^2 + 7 \times 3) - ((-1)^3 - 3 \times (-1)^2 + 7 \times (-1))$ $= 32$

Half Term 2A (ANSWERS)	Week 2

1	a = 12 r = 0.2 $\quad S_n = \frac{12(1-0.2^n)}{1-0.2}$ $S_n = 15(1-0.2^n)$
2	$u = 2x - 2x^3 \quad y = \ln u$ $\frac{du}{dx} = 2 - 6x^2 \qquad \frac{dy}{du} = \frac{1}{u}$ $\frac{dy}{dx} = \frac{2-6x^2}{2x-2x^3}$
3	$(1-4x)^{\frac{1}{2}}$ $= 1 + \frac{1}{2}(-4x) + \frac{\left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)}{2!}(-4x)^2 + \frac{\left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)}{3!}(-4x)^3$ $= 1 - 2x - 2x^2 - 4x^3$
4	$Arc\ length = 5 \times \frac{2\pi}{3}$ $= \frac{10\pi}{3}$ $Perimeter = 10 + \frac{10\pi}{3}$
5	$\int_{-4}^{-1} 5 - 3x^2 dx = [5x - x^3]$ $(5 \times -1 - (-1)^3) - (5 \times -4 - (-4)^3)$ $= -48$

Half Term 2A (ANSWERS)	Week 3

1	$a + 9d = 104$ $a + 13d = 152$ $4d = 48$ $d = 12$ $a = -4$ $\quad\quad -4 + 12(n - 1) = 368$ $n = 32$
2	$u = 2x^3 - 2x \quad y = u^{\frac{1}{2}}$ $\frac{du}{dx} = 6x^2 - 2 \quad\quad \frac{dy}{du} = \frac{1}{2}u^{-\frac{1}{2}}$ $\frac{dy}{dx} = \frac{6x^2-2}{2\sqrt{2x^3-2x}}$
3	$(1-2x)^{-1} = 1 + 2x + 4x^2 + 8x^3$ $2(1-2x)^{-1} = 2 + 4x + 8x^2 + 16x^3$
4	$4sin\theta = \frac{3cos\theta}{sin\theta}$ $2sin^2\theta - 3cos\theta = 0$ $2 - 2cos^2\theta - 3cos\theta = 0$ $2cos^2\theta + 3cos\theta - 2 = 0$ $cos\theta \neq -2 \quad cos\theta = \frac{1}{2} \quad\quad \theta = \frac{\pi}{3}, \frac{5\pi}{3}$
5	$\int_1^3 4x^2 - 4x + 1dx$ $\left[\frac{4x^3}{3} - 2x^2 + x\right]$ $= \left(\frac{4\times27}{3} - 2\times9+3\right) - \left(\frac{4\times1}{3} - 2\times1+1\right)$ $= 20\frac{2}{3}$

Half Term 2A (ANSWERS)	Week 4

1	$5 = 5k + 3$ $5k = 2$ $k = 0.4$
2	$u = 2e^{2x} - 1 \quad y = u^3$ $\frac{du}{dx} = 4e^{2x} \quad \frac{dy}{dx} = 3u^2$ $\frac{dy}{dx} = 12e^{2x}(2e^{2x} - 1)^2$
3	$(2-x)^{-1} = 1 + \frac{1}{4}x + \frac{1}{8}x^2 + \frac{1}{16}x^3$ $(x+1)(\frac{1}{2} + \frac{1}{4}x + \frac{1}{8}x^2 + \frac{1}{16}x^3)$ $= \frac{1}{2} + \frac{3}{4}x^2 + \frac{3}{8}x^2 + \frac{3}{16}x^3$
4	$8sin^2 2\theta cos2\theta = \frac{sin^2 2\theta}{cos^2 2\theta}$ $8cos^3 2\theta = 1$ $cos2\theta = \frac{1}{2}$ $2\theta = \frac{\pi}{3}, \frac{5\pi}{3}$ $\theta = \frac{\pi}{6}, \frac{5\pi}{6}$
5	$\int_1^3 6x^2 + 4\, dx$ $= [2x^3 + 4x]$ $(2 \times 27 + 4 \times 3) - (2 \times 1 + 4 \times 1)$ $= 60$

1

$ar = 10$

$ar^3 = 62.5$

$r^2 = 6.25$

$r = 2.5$ $\quad S_5 = \frac{4(2.5^5 - 1)}{2.5 - 1}$

$a = 4$

$= 257.75$

2

$u = \cos x \quad y = u^3$

$\frac{du}{dx} = -\sin x \qquad \frac{dy}{du} = 3u^2$

$\frac{dy}{dx} = -3 \sin x \cos^2 x$

3

$(1 + 3x)^{-1} = 1 - 3x + 9x^2 - 27x^3$

$3(3 + x)^{-1} = 1 - \frac{1}{3}x + \frac{1}{9}x^2 - \frac{1}{27}x^3$

$1 - 3x + 9x^2 - 27x^3 \ldots\ldots + 1 - \frac{1}{3}x + \frac{1}{9}x^2 - \frac{1}{27}x^3$

$= 2 - \frac{10}{3}x + \frac{82}{9}x^2 - \frac{730}{27}x^3$

4

$r \times \frac{\pi}{6} = 8$

$r = \frac{48}{\pi}$

Area of triangle $= \frac{1}{2} \times \frac{48}{\pi} \times \frac{48}{\pi} \times \sin\frac{\pi}{6}$

$= 58.4\ cm^2$

5

$\int_1^4 2x^{-\frac{1}{2}}\, dx$

$= \left[4\sqrt{x}\right]$

$= 4 \times 2 - 4 \times 1 = 4$

Half Term 2A (ANSWERS)	Week 6
1	$S_1 = 25 \quad S_2 = 54 \quad S_3 = 87$ *1st term = 25* *2nd term = 29* *3rd term = 33* $\quad u_n = 25 + 4(n-1)$
2	$u = \ln x + 4 \quad y = u^{-3}$ $\frac{du}{dx} = \frac{1}{x} \quad \frac{dy}{du} = -3u^{-4}$ $\frac{dy}{dx} = \frac{-3}{x(\ln x + 4)^4}$
3	$(1-x)^{\frac{1}{2}} = 1 - \frac{1}{2}x - \frac{1}{8}x^2$ $(1+x)^{-\frac{1}{2}} = 1 - \frac{1}{2}x + \frac{3}{8}x^2$ $(1 - \frac{1}{2}x - \frac{1}{8}x^2)(1 - \frac{1}{2}x + \frac{3}{8}x^2)$ $= 1 - \frac{1}{2}x - \frac{1}{2}x^2$
4	$A_1 = \frac{1}{2} \times 4 \times \theta \quad A_2 = 10\theta$ $10\theta = \frac{1}{2} \times 81\theta - \frac{1}{2} \times (OX)^2\theta$ $(OX)^2 = 61$ $OX = \sqrt{61}$
5	$x^2 - 4x + 4 = 9$ $x^2 - 4x - 5 = 0$ $(x-5)(x+1) = 0 \quad x = -1 \text{ and } x = 5$ $\int_{-1}^{5} 9 - x^2 + 4x - 4\, dx$ $= \left[5x - \frac{x^3}{3} + 2x^2\right]$ $= \left(25 - \frac{125}{3} + 50\right) - \left(-5 + \frac{1}{3} + 2\right) = 36$

Half Term 2A (ANSWERS)	Week 7
1	$a = 2 \;\; r = 3$ $\frac{2(3^n-1)}{3-1} > 200000$ $3^n > 200001$ $n > \frac{ln(200001)}{ln\,3}$ $\quad n > 11.11 \quad$ 12 terms needed
2	$u = 2 - \sin 2x \quad y = \ln u$ $\frac{du}{dx} = -2cos2x \quad \frac{dy}{du} = \frac{1}{u}$ $\frac{dy}{dx} = -2cos2x \times \frac{1}{2-sin2x}$ $\frac{dy}{dx} = \frac{-2cos2x}{2-sin2x}$
3	$(4+x)^{\frac{1}{2}} = 2 + \frac{1}{4}x - \frac{1}{64}x^2$ $(1-x)^{-\frac{1}{2}} = 1 + \frac{1}{2}x + \frac{3}{8}x^2$ $(2 + \frac{1}{4}x - \frac{1}{64}x^2)(1 + \frac{1}{2}x + \frac{3}{8}x^2)$ $= \; 2 + \frac{5}{4}x + \frac{55}{64}x^2$
4	$12^2 = 10^2 + 10^2 - 2 \times 10 \times 10 \times \cos\theta$ $\theta = 1.287$ radians Perimeter $= 10 \times 1.287 + 12$ $= 24.9$ cm (3 s.f)
5	$\frac{dy}{dx} = 4 - 10x^{-2}$ $y = 4x + 10x^{-1} + c$ When $x = 5 \quad y = 16$ $16 = 20 + 2 + c$ $c = -6$ $\qquad y = 4x + \frac{10}{x} - 6$