Half Term 4B (ANSWERS)	Week 1

1

$y = x^{\frac{1}{2}} + x^{-2}$

$\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}} - 2x^{-3}$ $\quad x = 4$ $\quad \frac{dy}{dx} = \frac{1}{2\sqrt{4}} - \frac{2}{4^3}$

$= \frac{7}{32}$

2

$2(3i + 2j) - (2i - 3j)$

$= 6i + 4j - 2i + 3j$

$= 4i + 7k$

3

$\frac{1}{5}log32 - 2\,log\,4 + log64$

$= log32^{\frac{1}{5}} - 2\,log\,2^2 + log2^6$

$= log2 - 4\,log\,2 + 6log2$

$= log\ 8$

4

$(3x + 1)\,log\,3 = log\ 18$

$3x\,log\,3 + log3 = log\ 18$

$3x\,log\,3 = log\ 6$

$x = \frac{log\,6}{3\,log\,3}$

5

$\int 3x^2 - 2x + 4\,dx = x^3 - x^2 + 4x + c$

Half Term 4B (ANSWERS)	Week 2

1

$y = \frac{1}{x} - x^2 + \frac{1}{x^3} - 1$

$\frac{dy}{dx} = -\frac{1}{x^2} - 2x - \frac{3}{x^4}$

2

$4p + q = -1$
$3p - 2q = -9$
$\underline{8p + 2q = -2}$
$11p = -11$
$p = -1 \quad q = 3$

3

$log_4 64 + log_3 27$

$log_4 4^3 + log_3 3^3$

$= 3 + 3$

$= 6$

4

$(3x - 2)log2 = log6$

$3xlog2 = log24$

$x = \frac{log24}{log8}$

5

$2x^3 + 2x^2 - 3x + c$

$(16 + 8 - 6) - (2 + 2 - 3) = 17$

Half Term 4B (ANSWERS)	Week 3

1

$$y = 4x^{-2} + x$$

$\frac{dy}{dx} = -8x^{-3} + 1$ $\quad -8x^{-3} + 1 = 0$

$x^3 = 8 \quad x = 2$

$(2,\ 3)$

2

$\boldsymbol{a} - 2\boldsymbol{b} = -2i + 3j - 2(6i - j)$
$= -2i + 3j - 12i + 2j$
$= -14i + 5j$
$|14i + 5j| = \sqrt{14^2 + 5^2}$
$= \sqrt{221}$

3

$3\log x + 4\log y - 2\log (xy)$

$= \log x^3 + \log y^4 - \log x^2y^2$

$= \log \frac{x^3y^4}{x^2y^2}$

$= \log xy^2$

4

$30e^{-0.4t} = 15$
$e^{-0.4t} = 0.5$
$-0.4t = \ln 0.5$
$t = \frac{\ln 0.5}{-0.4}$
$t = 1.73$ seconds

5

$\int 4x - 3x^2 + 1\, dx = 2x^2 - x^3 + x + c$

$(8 - 8 + 2) - (0) = 2$

Half Term 4B (ANSWERS)	Week 4

1

$y = 2x^{\frac{1}{2}} - 1$

$\frac{dy}{dx} = x^{-\frac{1}{2}}$ $\quad x^{-\frac{1}{2}} = 3$ $\quad x = \frac{1}{9}$ $\; y = -\frac{7}{9}$

$\left(\frac{1}{9}, -\frac{7}{9}\right)$

2

$5a + 2b = 11$
$2a - b = 8$
$\underline{4a - 2b = 16}$
$9a = 27$
$a = 3$ $\quad b = 2$

3

$log_3(4x + 1) = 2$

$4x + 1 = = 3$

$4x + 1 = 9$

$x = 2$

4

$15000e^{-0.3t} = 5000$
$e^{-0.3t} = \frac{1}{3}$
$t = \frac{ln\frac{1}{3}}{-0.3}$
$t = 3.66$ *years*

5

$\int 2x^2 + 12x + 18\, dx = \frac{2}{3}x^3 + 6x^2 + 18x + c$

$\left(\frac{2}{3} + 6 + 18\right) - \left(-\frac{2}{3} + 6 - 18\right) = 37\frac{1}{3}$

Half Term 4B (ANSWERS)	Week 5

1

$y = x^{-2} - 4$

$\frac{dy}{dx} = -2x^{-3}$ $\quad y = 0 \quad x = \pm\frac{1}{2}$

Gradient = -16 and 16

2

$tan^{-1}\left(\frac{2}{5}\right) = 21.8°$

3

$2log_a 4 - log_a 4 + \frac{1}{2}log_a 16 = \frac{1}{2}log_a x$

$log_a 4 + log_a 4 = \frac{1}{2}log_a x$

$log_a 4^2 = log_a x^{\frac{1}{2}}$

$x^{\frac{1}{2}} = 16 \quad x = 256$

4

$4000 \times 1.035^t = 10000$

$1.035^t = 2.5$

$t \ln 1.035 = \ln 2.5$

t =26.6 years

5

$\int 3x^2 + 10x - 2\, dx = x^3 + 5x^2 - 2x + c$

(8 + 20 - 4) – (1+5 -2) = 20

Half Term 4B (ANSWERS)	Week 6

1

$y = x^{\frac{3}{2}} + 2x^{\frac{1}{2}}$

$\frac{dy}{dx} = \frac{3}{2}x^{\frac{1}{2}} + x^{-\frac{1}{2}}$ $\quad x = 9$ $\quad \frac{dy}{dx} = \frac{3\sqrt{9}}{2} + \frac{1}{\sqrt{9}}$

$= \frac{29}{6}$

2

$\overrightarrow{AB} = \begin{pmatrix} -1 \\ 1 \end{pmatrix} - \begin{pmatrix} 3 \\ 4 \end{pmatrix} = \begin{pmatrix} -4 \\ -3 \end{pmatrix}$

$\overrightarrow{CD} = 5\begin{pmatrix} -4 \\ -3 \end{pmatrix}$

$= \begin{pmatrix} -20 \\ -15 \end{pmatrix}$

3

$log_2(x^2 + 4) = log_2 8$

$x^2 + 4 = 8$

$x^2 = 2$

$x = \pm\sqrt{2}$ $\qquad x = \sqrt{2}$

4

$m_0 e^{-60k} = \frac{m_0}{2}$

$e^{-60k} = 0.5$

$-60k = \ln 0.5$

$k = \frac{\ln 0.5}{-60}$ $\qquad k = 0.0116$

5

$\int 10x - 3x^2 - 8\, dx = 5x^2 - x^3 + 8x + c$

Half Term 4B (ANSWERS)	Week 7

1

$y = x^{\frac{7}{2}} + x^{-\frac{3}{2}}$

$\frac{dy}{dx} = \frac{7}{2}x^{\frac{5}{2}} - \frac{3}{2}x^{-\frac{5}{2}}$ $\quad x = 4 \quad$ $\frac{dy}{dx} = \frac{7\times4^{\frac{5}{2}}}{2} - \frac{3}{2\times4^{\frac{5}{2}}}$

$= \frac{7165}{64}$

2

2p + 5q = 14
-p + 2q = 11
-2p + 4q = 22
9q = 36
q = 4 p = -3

3

$log_a(x+3) - log_a 2 = log_a 3x$

$log_a \frac{(x+3)}{2} = log_a 3x$

$\frac{(x+3)}{2} = 3x \quad 6x = x + 3 \quad 5x = 3 \quad x = \frac{3}{5}$

4

$120 = 200e^{-10k}$
$e^{-10k} = 0.6$
$-10\,k = ln\ 0.6$
$k = \frac{ln\ 0.6}{-10}$
$k = 0.0511$

5

$\int 2x^3 - 5x^2 - 3x\,dx = \frac{1}{2}x^4 - \frac{5}{3}x^3 - \frac{3}{2}x^2 + c$