Updates on the Book

1. Page 47, Exercise 16.4

In the expansion of $\dfrac{5x+3-\dfrac{30}{k}}{(3+kx)^2}$, the coefficient of x^2 is $-\dfrac{37}{27}$, where $0<k<10$.

2. Page 93, Exercise 30.1

The vector equations of the lines L_1 and L_2 are $\mathbf{r}=\begin{pmatrix}15\\11\\6\end{pmatrix}+t\begin{pmatrix}6\\3\\2\end{pmatrix}$ and $\mathbf{r}=\begin{pmatrix}0\\7\\8\end{pmatrix}+s\begin{pmatrix}-3\\2\\6\end{pmatrix}$ respectively.

D is a point on L_3 such that the coordinates of D are $(73,-205,d)$.

(d) Find the value of d.

[2]

(e) Hence, show that the volume of the pyramid ABCD is $\dfrac{12005}{3}$.

[4]

3. Page 94, Exercise 30.3

(e) U is a point such that UQ is perpendicular to QRST, and the volume of the pyramid QRSTU is $166\sqrt{29}$.

4. Page 100, Exercise 32.3

(a) Show that the vector equation of the line of intersection of the planes π_1 and π_2 is $\mathbf{r}=\begin{pmatrix}0\\-12\\0\end{pmatrix}+t\begin{pmatrix}0\\2\\1\end{pmatrix}$.

5. Page 202, Exercise 65.1

(b) By using the Maclaurin series for $e^{2x}-1$ and $\ln(1+x)$, find the Maclaurin series for $\ln\left[(3e^{2x}-2)(4e^{2x}-3)\right]$ up to and including the x^2 term.

[9]

(c) Hence, find $\lim\limits_{x\to 0}\dfrac{2+\ln\left[(3e^{2x}-2)(4e^{2x}-3)\right]}{f(x)}$.

[3]

6. Page 214, Example 70

The initial acceleration and the initial velocity are $\sqrt{3}\ \text{ms}^{-2}$ and $\ln\dfrac{\sqrt{3}}{2}\ \text{ms}^{-1}$ respectively.

(d) Show that $v=-\dfrac{1}{2}\ln\left(\dfrac{a^2+9}{9}\right)$.

7. Page 215, Example 70

(b) Let $u=\cos\left(-3t+\dfrac{\pi}{6}\right)$. (M1) for substitution

$\dfrac{\mathrm{d}u}{\mathrm{d}t}=3\sin\left(-3t+\dfrac{\pi}{6}\right)\Rightarrow 3\sin\left(-3t+\dfrac{\pi}{6}\right)\mathrm{d}t=\mathrm{d}u$

$\therefore\int \mathrm{d}v=\int\dfrac{1}{u}\mathrm{d}u$ (A1) for correct working

$v=\ln u+D$

$v=\ln\left|\cos\left(-3t+\dfrac{\pi}{6}\right)\right|+D$ A1

$\ln\dfrac{\sqrt{3}}{2}=\ln\left|\cos\left(-3(0)+\dfrac{\pi}{6}\right)\right|+D$ (M1) for substitution

$\ln\dfrac{\sqrt{3}}{2}=\ln\dfrac{\sqrt{3}}{2}+D$

$D=0$ (A1) for correct value

$\therefore v=\ln\left|\cos\left(-3t+\dfrac{\pi}{6}\right)\right|$ A1

8. Page 216, Example 70

(c) $= \int_0^{\frac{\pi}{8}} \left| \ln \left| \cos\left(-3t + \frac{\pi}{6}\right) \right| \right| \mathrm{d}t$

(d) $v = \ln \left| \cos\left(-3t + \frac{\pi}{6}\right) \right|$

$v = -\ln \left| \frac{1}{\cos\left(-3t + \frac{\pi}{6}\right)} \right|$ M1

$v = -\ln \left| \sec\left(-3t + \frac{\pi}{6}\right) \right|$ A1

$v = -\frac{1}{2} \ln \left(\sec^2\left(-3t + \frac{\pi}{6}\right) \right)$

$v = -\frac{1}{2} \ln \left(\tan^2\left(-3t + \frac{\pi}{6}\right) + 1 \right)$ A1

$\therefore v = -\frac{1}{2} \ln \left(\left(\frac{a}{3}\right)^2 + 1 \right)$ A1

$v = -\frac{1}{2} \ln \left(\frac{a^2}{9} + 1 \right)$

$v = -\frac{1}{2} \ln \left(\frac{a^2 + 9}{9} \right)$ AG

9. Page 243, Exercise 79.2

(c) the standard deviation.

10. Page 275, Answers of Exercise 30

30.1 **(b)** 49

(c) $\begin{cases} x = 3 + 2u \\ y = 5 - 6u \\ z = 2 + 3u \end{cases}$

(d) $d = 107$

(e) Refer to solution

11. Page 284, Answers of Exercise 65

65.1 **(b)** $14x - 36x^2 + \cdots$

(c) 2

12. Page 285, Answers of Exercise 71

71.4 **(b)** 141120