For continuous growth, 
\[ u_n = u_0 e^{rt} \]
where \( u_0 \) is the initial amount, \( r \) is the annual percentage rate, and \( t \) is the number of years.

Use this formula to find the final amount if $1000 is invested for 1 year at a fixed rate of 6% per annum, where the interest is paid continuously.

The following errata were made on 17/Jan/2020

page 61 CHAPTER 2 INVESTIGATION 2, question 5, should read:

5 For continuous growth, \( u_n = u_0 e^{rt} \) where \( u_0 \) is the initial amount, \( r \) is the annual percentage rate, and \( t \) is the number of years.

Use this formula to find the final amount if $1000 is invested for 1 year at a fixed rate of 6% per annum, where the interest is paid continuously.

page 661 CHAPTER 24 SECTION B, last line of summary table, should read:

### SUMMARY OF IMPORTANT MACLAURIN SERIES

<table>
<thead>
<tr>
<th>Function</th>
<th>Maclaurin series</th>
<th>Interval of convergence</th>
</tr>
</thead>
<tbody>
<tr>
<td>( e^x )</td>
<td>( 1 + x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + \frac{1}{4!}x^4 + \ldots )</td>
<td>( x \in \mathbb{R} )</td>
</tr>
<tr>
<td>( \sin x )</td>
<td>( x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots )</td>
<td>( x \in \mathbb{R} )</td>
</tr>
<tr>
<td>( \cos x )</td>
<td>( 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots )</td>
<td>( x \in \mathbb{R} )</td>
</tr>
<tr>
<td>( \arctan x )</td>
<td>( x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \ldots )</td>
<td>(</td>
</tr>
<tr>
<td>( \ln(1 + x) )</td>
<td>( x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots )</td>
<td>(-1 &lt; x \leq 1 )</td>
</tr>
<tr>
<td>( (1 + x)^p ), ( p \in \mathbb{R} )</td>
<td>( 1 + \sum_{k=1}^{\infty} \frac{p(p-1)\ldots(p-k+1)}{k!} x^k )</td>
<td>(</td>
</tr>
</tbody>
</table>

The following erratum was made on 27/Jul/2020

page 906 ANSWERS EXERCISE 28C.1, question 2c, should read:

2c The times may be affected by:
- weather conditions
- walking speed
- physical fitness
- traffic.

page 700 EXERCISE 25H, question 4, should read:

4 Let \( y(x) = 1 + \sum_{n=1}^{\infty} \frac{p(p-1)\ldots(p-n+1)x^n}{n!} \) for \( |x| < 1 \). You may assume the series is convergent on this interval.
Suppose we wish to find the distribution of the random variable \( Y = g(X) \) where \( g \) is an increasing and invertible function.

i. Show that \( F_Y(y) = F_X(g^{-1}(y)) \).

ii. Show that \( f_Y(y) = f_X(g^{-1}(y)) \times \frac{dg}{dy}(g^{-1}(y)) \).

The following errata were made on 04/Jun/2020

EXERCISE 28B, question 15 b, should read:

15 b Suppose we wish to find the distribution of the random variable \( Y = g(X) \) where \( g \) is an increasing and invertible function.

i. Show that \( F_Y(y) = F_X(g^{-1}(y)) \).

ii. Show that \( f_Y(y) = f_X(g^{-1}(y)) \times \frac{dg}{dy}(g^{-1}(y)) \).

EXERCISE 21F, question 21, should read:

21 Find \( \int \frac{1}{ax^2 + bx + c} \, dx \), \( a \neq 0 \).

Hint: You will need to consider the cases \( b^2 < 4ac \), \( b^2 > 4ac \), and \( b^2 = 4ac \) separately.

EXERCISE 28D.1, question 10 b, was altered in error. It should read as originally printed:

10 a \( \approx 84.1\% \) b \( \approx 0.880 \)

The following errata were made on 13/May/2020

EXERCISE 18C, question 4 c, should read:

4 a increasing for \( x > 0 \), decreasing for \( x < 0 \)

b never increasing, decreasing for all \( x \in \mathbb{R} \)

c increasing for \( x > 0 \), never decreasing

d increasing for \( x > -\frac{a}{2} \), decreasing for \( x \leq -\frac{a}{2} \)

EXERCISE 18C, question 25 b, should read:

25 a \( 0 \leq x \leq \frac{\pi}{2} \) and \( \frac{2\pi}{2} \leq x \leq 2\pi \)

b \( f'(x) = -\frac{\sin x}{2\sqrt{\cos x}} \), increasing for \( \frac{2\pi}{2} \leq x \leq 2\pi \),

decreasing for \( 0 \leq x \leq \frac{\pi}{2} \)

EXERCISE 21B, question 6 b, should read:

6 a \( \frac{4x^2 + c}{\ln 4} \)

b \( 3 \ln |x| - \log_2 |x| + c \)

c \( \frac{5x - 2 \times 7^x + c}{\ln 5} \)

d \( -\csc x + c \)

e \( \sin x - \cot x + c \)

f \( -\frac{8}{3x\sqrt{2}} - \frac{1}{5} \sec x + c \)
The following errata were made on 11/May/2020

page 72 EXERCISE 3B, question 6, should read:

6 Suppose \( \log_a b = x, \ x \neq 0 \). Find, in terms of \( x \), the value of \( \log_b a \).

page 582 CHAPTER 21 EXAMPLE 17, question should read:

**Example 17**

Find \( \int \frac{\sqrt{x^2 - 9}}{x} \, dx \), where \( x \geq 3 \).

Let \( x = 3 \sec \theta \) \( \therefore \frac{dx}{d\theta} = 3 \sec \theta \tan \theta \)

page 582 EXERCISE 21F, questions 17 b, 18 f, and 18 l, should read:

17 Find:

\[
\begin{align*}
\text{a} & \quad \int \frac{1}{36 + 4x^2} \, dx \quad \text{using} \quad x = 3 \tan \theta \\
\text{b} & \quad \int \frac{\sqrt{4x^2 - 1}}{5x} \, dx, \ x \geq \frac{1}{2} \quad \text{using} \quad x = \frac{1}{2} \sec \theta.
\end{align*}
\]

18 Integrate with respect to \( x \):

\[
\begin{align*}
\text{a} & \quad \frac{x^2}{9 + x^2} \\
\text{b} & \quad \frac{x^2}{\sqrt{1 - x^2}} \\
\text{c} & \quad \sqrt{9 - x^2} \\
\text{d} & \quad \frac{4 \ln x}{x(1 + |\ln x|^2)} \\
\text{e} & \quad \frac{1 - 2x}{\sqrt{1 - x^2}} \\
\text{f} & \quad \frac{\sqrt{x^2 - 4}}{x}, \ x \geq 2 \\
\text{g} & \quad \frac{1}{\sqrt{9 - 4x^2}} \\
\text{h} & \quad \frac{1}{x(9 + 4|\ln x|)} \\
\text{i} & \quad \frac{1}{x^2 \sqrt{16 - x^2}} \\
\text{j} & \quad \frac{x + 4}{x^2 + 4} \\
\text{k} & \quad \frac{1}{x(x^2 + 16)} \\
\text{l} & \quad \frac{3}{x \sqrt{x^2 - 4}}, \ x > 2 \\
\text{m} & \quad \frac{1}{x^2 \sqrt{16 - x^2}} \\
\text{n} & \quad \frac{1}{x^2 + 2x + 3} \\
\text{o} & \quad \frac{1}{x(1 + x^2)} \\
\text{p} & \quad x^2 \sqrt{4 - x^2}
\end{align*}
\]

page 667 CHAPTER 24 EXAMPLE 6, solution to part b should read:

\[
\begin{align*}
\text{b} \quad & \quad \arccos x - \arccos(0) = \int_0^x \frac{-1}{\sqrt{1 - t^2}} \, dt \\
& \quad \therefore \arccos x - \frac{\pi}{2} = - \int_0^x \left( 1 + \sum_{k=1}^{\infty} \frac{(2k)!}{4^k(k!)^2} t^{2k} \right) \, dt \\
& \quad = - \left[ \left( t \right)_0^x + \sum_{k=1}^{\infty} \frac{(2k)!}{4^k(k!)^2} \int_0^x t^{2k} \, dt \right] \\
& \quad = - \left[ x + \sum_{k=1}^{\infty} \frac{(2k)!}{4^k(k!)^2} \left( \frac{x^{2k+1}}{2k+1} \right)_0^x \right] \\
& \quad = - \left( x + \sum_{k=1}^{\infty} \frac{(2k)!}{4^k(k!)^2(2k+1)} x^{2k+1} \right) \\
& \quad \therefore \arccos x = \frac{\pi}{2} - x - \sum_{k=1}^{\infty} \frac{(2k)!}{4^k(k!)^2(2k+1)} x^{2k+1}
\end{align*}
\]

This is valid provided \(|x| < 1\). **This covers** the domain of \( \arccos x \) except its endpoints \( \pm 1 \).
page 814  **ANSWERS EXERCISE 3H**, question 10 a, should read:

10 a \( \frac{x}{e} \), Domain is \( \{ x \mid x > 0 \} \), Range is \( \{ y \mid y > 0 \} \)

page 835  **ANSWERS EXERCISE 10A**, question 3 a, should read:

3 a \( 2 + 4 + 6 + 8 + 10 + \ldots + 2n = n(n + 1) \),
\[ \sum_{i=1}^{n} 2i = n(n + 1) \quad \text{for all} \quad n \in \mathbb{Z}^+ \]

page 850  **ANSWERS EXERCISE 14A**, question 6 a, should read:

6 a \(-1 + 5t\)

page 853  **ANSWERS REVIEW SET 14A**, question 5 c, should read:

5 a A reflection in the \( \mathbb{R} \)-axis, followed by a stretch with scale factor 2.

b A rotation of \( \pi \) about O, followed by a stretch with scale factor \( \frac{1}{2} \).

c A reflection in the \( \mathbb{R} \)-axis, followed by an anticlockwise rotation of \( \frac{\pi}{2} \) about O.

page 854  **ANSWERS EXERCISE 15A**, question 7, replace with:

7 \( \lim_{x \to a} f(x) = l \iff \lim_{x \to a} f(x) = \lim_{x \to a} l \)
\[ \iff \lim_{x \to a} f(x) - \lim_{x \to a} l = 0 \]
\[ \iff \lim_{x \to a} (f(x) - l) = 0 \]

page 872  **ANSWERS REVIEW SET 18A**, question 24 c, should read:

24 a concave up for \( x \geq \frac{4}{3} \), concave down for \( x \leq \frac{4}{3} \)

b concave up for \( x \leq -3 \),
concave down for \( -3 \leq x < 0 \) and \( x > 0 \)

c concave up for \( -4 < x \leq -2 \) and \( x > 0 \),
concave down for \( x < -4 \) and \( -2 \leq x < 0 \)

page 881  **ANSWERS EXERCISE 21B**, question 11 d, should read:

11 d \( f(x) = 2x + 3 \arctan x + c \)
The following errata were made on 27/Apr/2020

page 38 CHAPTER 1 ACTIVITY 3, question 4 should read:

4 Predict the graph of \( f(x) = \sum_{k=1}^{\infty} \frac{\sin((2k-1)x)}{2k-1} \).

page 117 EXERCISE 5C, questions 13 c and 14 c, should read:

13 a Suppose a quadratic function with rational coefficients has the irrational zero \( p + q\sqrt{n} \).

Prove that the other zero must be the radical conjugate \( p - q\sqrt{n} \).

b \( 1 - \sqrt{2} \) is a zero of \( x^2 + ax + b \) where \( a, b \in \mathbb{Q} \). Find \( a \) and \( b \).

c Find all real quadratic functions such that one zero is \( 2 + \sqrt{5} \).

14 a Prove that if a real quadratic function has one zero \( p + qi \), then the other zero must be the complex conjugate \( p - qi \).

b \( 3 + i \) is a zero of \( x^2 + ax + b \) where \( a, b \in \mathbb{R} \). Find \( a \) and \( b \).

c Find all real quadratic functions such that one zero is \( \sqrt{2} + i \).

d \( a + ai \) is a zero of \( x^2 + 4x + b \) where \( a, b \in \mathbb{R} \). Find \( a \) and \( b \).

page 150 REVIEW SET 5B, question 28 a, replace with:

28 Find all zeros of:

a \( 3z^3 - z^2 + 21z - 7 \)

b \( x^3 + 6x^2 - 9x - 14 \)

page 186 EXERCISE 7E, question 7, should read:

7 A Mahjong set contains:

- 4 of each of 9 tiles, in each of 3 suits
- 4 of each of 3 dragons
- 1 of each of 4 seasons.

Explain why the total number of ways in which the tiles can be ordered is \( \frac{144!}{(4!)^{34}} \).

page 231 REVIEW SET 9A, question 10 a, should read:

10 a Prove that the fifth powers of the numbers \( k = 0, 1, 2, 3, ..., 9 \) all have last digit \( k \).

b Hence prove that \( n \) always has the same last digit as its 5th power \( n^5 \), for all \( n \in \mathbb{Z} \).

Hint: Consider writing an integer in the form \( 10m + k \).

page 238 CHAPTER 10 EXAMPLE 3, solution to part a, third line should read:

a If \( n = 0 \), \( 4^n + 2 = 4^0 + 2 = 3 \) which is divisible by 3.

\[
4^n + 2 = (1 + 3)^n + 2 = \binom{n}{0} 3^0 + \binom{n}{1} 3^1 + \binom{n}{2} 3^2 + \binom{n}{3} 3^3 + ... + \binom{n}{n-1} 3^{n-1} + \binom{n}{n} 3^n + 2
\]

\[
= 3 + \binom{n}{1} 3 + \binom{n}{2} 3^2 + \binom{n}{3} 3^3 + ... + \binom{n}{n-1} 3^{n-1} + \binom{n}{n} 3^n
\]
When we perform this process we may obtain one of the forms below, with corresponding numbers of solutions:

\[
\begin{pmatrix} 1 & 0 & \square \\ 0 & 1 & \square \\ \square & \square & \square \end{pmatrix}
\]

1 solution

\[
\begin{pmatrix} 1 & 0 & \square \\ 0 & 0 & \square \\ \square & \square & \square \end{pmatrix}
\]

no solutions

\[
\begin{pmatrix} 1 & 0 & \square \\ 0 & 0 & 0 \\ \square & \square & \square \end{pmatrix}
\]

infinitely many solutions

Using row 3, \( z = -1 \)

Consider the system

\[
\begin{align*}
x + 4y + mz &= -m \\
(m + 1)x + 4y + z &= 1 \\
4x + 4y + z &= 1
\end{align*}
\]

where \( m \in \mathbb{R}, \ m \neq 0. \)

Find two vectors of length 3 units which are perpendicular to \((-1/4, 1)\).

\[
\begin{pmatrix} -1 \\ 4 \\ 1 \end{pmatrix} \cdot \begin{pmatrix} 4 \\ 1 \\ 1 \end{pmatrix} = -4 + 4 = 0
\]

\[\therefore \text{vectors of the form } k \begin{pmatrix} 4 \\ 1 \\ 1 \end{pmatrix}, \ k \neq 0 \text{ are perpendicular to } \begin{pmatrix} -1 \\ 4 \\ 1 \end{pmatrix}.\]

Now \( \begin{pmatrix} 4 \\ 1 \\ 1 \end{pmatrix} \) has length \( \sqrt{16 + 1} = \sqrt{17} \) units

\[\therefore |k| \sqrt{17} = 3 \]

\[\therefore |k| = \frac{3}{\sqrt{17}} \]

\[\therefore k = \pm \frac{3}{\sqrt{17}} \]

\[\therefore \text{the vectors of length 3 units which are perpendicular to } \begin{pmatrix} -1 \\ 4 \\ 1 \end{pmatrix} \]

are \( \pm \frac{3}{\sqrt{17}} \begin{pmatrix} 4 \\ 1 \end{pmatrix} \), which are \( \begin{pmatrix} 12/\sqrt{17} \\ 3/\sqrt{17} \end{pmatrix} \) and \( \begin{pmatrix} -12/\sqrt{17} \\ -3/\sqrt{17} \end{pmatrix} \).

Find two vectors of length:

ABCD is a quadrilateral in which P bisects both [AC] and [BD].
Find all points on the curve \( y = 4x^3 + 6x^2 - 13x + 1 \) where the gradient of the tangent is 11.

Consider the total area enclosed between \( y = -x^3 + x^2 + 6x \) and \( y = 2x + 4 \) on the interval \(-2 \leq x \leq 2\). 

a. Explain why the total area is equal to 
\[
\int_{-2}^{2} \left| (-x^3 + x^2 + 6x) - (2x + 4) \right| \, dx 
= \int_{-2}^{2} \left| -x^3 + x^2 + 4x - 4 \right| \, dx 
\]

Show that the Maclaurin series representation for \( \ln \left( \frac{1 + x}{1 - x} \right) \) is 
\[
\sum_{k=1}^{\infty} \frac{2}{2k - 1} x^{2k-1}. 
\]

a. Prove by mathematical induction that 
\[
\frac{d^n}{dx^n} (\arctan x) = \frac{i(-1)^{n-1}(n-1)!}{2} \left( \frac{1}{(x+i)^n} - \frac{1}{(x-i)^n} \right) \quad \text{for all} \quad n \in \mathbb{Z}^+. 
\]

b. Hence show that the Maclaurin series representation for \( \arctan x \) is 
\[
\sum_{k=1}^{\infty} \frac{(-1)^{k-1}}{2k-1} x^{2k-1}. 
\]

Since water and oil are immiscible, oil spilt in water will form a cylindrical patch on the surface of the water. The radius of the patch increases at a rate proportional to the thickness of the patch, which is the height of the cylinder.

What to do:

1. Click on the icon to access the demonstration. It shows the graph of the binomial distribution for \( X \sim B(n, p) \). Set \( n = 25 \) and \( p = 0.1 \).

a. What is the mode of \( X \)?

b. Describe the shape of the distribution.
page 805 ANSWERS REVIEW SET 1A, question 11 c, $x = 3$ is not a valid solution:

9 $x = 0, \frac{2}{7}, \pi, \frac{2\pi}{3}$, or $2\pi$

11 $x = \frac{16}{11}$

page 809 ANSWERS EXERCISE 2F, question 18, should read:

18 $e^1 \approx \sum_{k=0}^{19} \frac{1}{k!} \approx 2.718281828$

page 818 ANSWERS EXERCISE 5D, questions 2 b and 4, should read:

2 a $a = 2, b = -2$ or $a = -2, b = 2$
   b $a = 2, b = -1$
   c $a = 3, b = -1$

4 $a = -2, b = 2, x = -1 \pm \sqrt{3}$

page 821 ANSWERS REVIEW SET 5A, question 19 b, should have diagram:

19 a $m = 1, n = \pm 2$
   \[
   \begin{array}{c}
   \text{y}
   \end{array}
   \]
   \[
   \begin{array}{c}
   \text{x}
   \end{array}
   \]
   \[
   \begin{array}{c}
   \text{1 - 2\sqrt{3}}
   \end{array}
   \]
   \[
   \begin{array}{c}
   \text{1 + 2\sqrt{3}}
   \end{array}
   \]
   \[
   \begin{array}{c}
   \text{y = 2(x² - 2x + 5)(x² - 2x - 11)}
   \end{array}
   \]

To make room for this diagram, the following questions have moved to subsequent pages:

ANSWERS REVIEW SET 5A questions 24 a and b moved from page 821 to page 822,
ANSWERS REVIEW SET 5B questions 25 and 26 moved from page 822 to page 823,
ANSWERS EXERCISE 6C.1 question 3 a moved from page 823 to page 824.

page 822 ANSWERS REVIEW SET 5B, question 3 b, should read:

3 a $(3x - 2)$ and $(x - 3)$, zeros are $\frac{2}{3}$ and 3
   b $(z - 1)$, $(2z + 1)$, and $(z² - 2z + 6)$,
   zeros are $1, -\frac{1}{2}, 1 \pm i\sqrt{7}$

page 823 ANSWERS REVIEW SET 5B, question 28 a, should read:

28 a $\frac{1}{7}$ and $\pm i\sqrt{7}$
   b $-7, -1, \text{ and } 2$

page 823 ANSWERS EXERCISE 6B, question 7 d, should include vertical asymptote label:

7 d

\[
\begin{array}{c}
\text{y = 4}
\end{array}
\]

\[
\begin{array}{c}
\text{y = f(x) = x - 1}
\end{array}
\]

\[
\begin{array}{c}
\text{y = [f(x)]²}
\end{array}
\]

\[
\begin{array}{c}
\text{y = 2}
\end{array}
\]

\[
\begin{array}{c}
\text{x = 1}
\end{array}
\]

\[
\begin{array}{c}
\text{(-5, 1)}
\end{array}
\]

\[
\begin{array}{c}
\text{y = f(x) = 2x + 4}
\end{array}
\]

\[
\begin{array}{c}
\text{y = 2}
\end{array}
\]

\[
\begin{array}{c}
\text{y = 2}
\end{array}
\]

\[
\begin{array}{c}
\text{x = 1}
\end{array}
\]

page 831 ANSWERS EXERCISE 7E, questions 8 b, 27 b, and 27 c, should read:

8 a $\frac{1}{2}n^2 - \frac{3}{2}n, \ n \in \mathbb{Z}^+$, $n \geq 2$
   b $\frac{1}{2}n^2 - \frac{1}{2}n^3 + \frac{11}{2}n^2 - \frac{1}{2}n, \ n \in \mathbb{Z}^+, \ n \geq 4$

27 a $\left(\frac{52}{13}\right) = 635,013,559,600$
   b $\left(\frac{13}{4}\right)\left(\frac{39}{7}\right) = 151,519,319,380$
   c $\left(\frac{13}{4}\right)\left(\frac{39}{7}\right) \approx 0.239$
page 832 ANSWERS REVIEW SET 7B, questions 11 a and 12, should read:

11 a 6435 b 2 627.625
12 4347

page 832 ANSWERS EXERCISE 8A, question 4 b, should read:

\[ (a + b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5 \]

page 834 ANSWERS EXERCISE 9C, questions 6 a and 7 a, should read:

6 a \( (a - b)(a + b) = b(a - b) \neq a + b = b \)
6 b \( \frac{4x - 40}{6 - x} = \frac{4x - 40}{13 - x} \neq 6 - x = 13 - x \)
7 a \( 6x - 12 = 3(x - 2) \neq 6x - 12 + 3(x - 2) = 0 \)
7 b \( x(x - 6) = 0(-3) \neq x = 3 \lor x - 6 = -3 \)

page 834 ANSWERS EXERCISE 9E, question 5, should read:

5 Hint: Let \( n = 7k, 7k + 1, \ldots, 7k + 6 \), and show that \( n^2 + 4 \) never leaves remainder 0 when divided by 7.

page 835 ANSWERS REVIEW SET 9B, question 4 b, should read:

4 a not equivalent b not equivalent

page 837 ANSWERS EXERCISE 11D, questions 8 c and d, should read:

8 c The system has infinitely many solutions if the last row is all zeros. This occurs when \( m = 3 \). The solutions have the form \( x = \frac{4 + 2t}{3}, y = \frac{-13 - 11t}{12}, z = t, \) where \( t \in \mathbb{R} \).
8 d \( x = 0, y = \frac{m}{2(m - 1)}, z = \frac{m + 1}{1 - m}, m \in \mathbb{R}, m \neq 1 \) or 3

page 837 ANSWERS REVIEW SET 11A, question 3 b, should read:

3 a \( \begin{pmatrix} 4 & -6 & -1 \\ a & 2 & 3 \end{pmatrix} \sim \begin{pmatrix} 4 & -6 & -1 \\ -3 & 0 & \end{pmatrix} \)
3 b \( \begin{pmatrix} 4 & -6 & -1 \\ -3 & 0 & \end{pmatrix} \sim \begin{pmatrix} 4 & -6 & -1 \\ -3 & 0 & \end{pmatrix} \)

page 838 ANSWERS REVIEW SET 11B, questions 1 b, 5 and 8 c, should read:

1 a consistent; \( x = \frac{4}{a}, y = 0 \) is a solution
1 b inconsistent; \( x + 4y + z \) cannot be equal to both 1 and \(-1\) simultaneously.
5 a If \( a = -8, b = 20 \), there are infinitely many solutions of the form \( x = 5 + 2t, y = t, \) where \( t \in \mathbb{R} \).
5 b If \( a = -8, b \neq 20 \), there are no solutions.
5 c If \( a \neq -8 \), the system has the unique solution \( x = 5 + 2 \left( \frac{b - 20}{a + 8} \right), y = -\frac{b - 20}{a + 8} \).
8 a \( \begin{pmatrix} 1 & 4 & -1 \\ 0 & 8 & -1 \\ 0 & 0 & k - 3 \end{pmatrix} \sim \begin{pmatrix} 1 & 4 & -1 \\ 0 & 8 & -1 \\ 0 & 0 & k - 3 \end{pmatrix} \)
b infinitely many solutions when \( k = 3 \):
\( x = \frac{t - 3}{2}, y = \frac{t + 9}{8}, z = t, \) where \( t \in \mathbb{R} \)
c \( x = -2, y = \frac{k + 1}{4}, z = -1, k \in \mathbb{R}, k \neq 3 \)
Page 841 ANSWERS EXERCISE 12I, question 14 c, should read:

14 a \[ \overrightarrow{AB} = \left(\frac{4}{k - 3}\right) \cdot |\overrightarrow{AB}| = \sqrt{16 + (k - 3)^2} \text{ units} \]

b \[ k = 0 \text{ or } 6 \]

c 

Page 847 ANSWERS EXERCISE 13H, question 7 e, diagram should be:

Page 851 ANSWERS EXERCISE 14D.3, question 7 a, should read:

7 a \[ |-z| = 3, \quad \arg(-z) = \theta \pm \pi \]

Page 854 ANSWERS EXERCISE 15B, question 4 c iii, should read:

4 a \[ x = 0 \text{ or } 2 \]

b 

c i does not exist

ii \[ -1 \]

iii \[ -\frac{1}{2} \]

Page 857 ANSWERS REVIEW SET 15B, question 7 a, should have correct function label:

7 a 

Page 859 ANSWERS EXERCISE 17A, question 9, should read:

9 \[ f''(2) = 14 \neq f'_1(2) = 16 \]

\[ \therefore \text{ not differentiable at } x = 2. \]

Page 871 ANSWERS EXERCISE 18H, questions 5 e and 10, should read:

5 e 

10 Hint: Consider \[ \lim_{x \to 0} \frac{\ln x}{x^k} \quad k > 0. \]
page 879 ANSWERS EXERCISE 21A, question 7, should read:

7 a \[
\frac{d}{dx}(3^x) = 3^x \ln 3
\]

\[
\therefore \int 3^x \ln 3 \, dx = 3^x + c
\]

\[
\therefore \int 3^x \, dx = \frac{3^x}{\ln 3} + c
\]

\[b\]

\[
\frac{d}{dx}(a^x) = a^x \ln a
\]

\[
\therefore \int a^x \ln a \, dx = a^x + c, \quad a > 0, \quad a \neq 1
\]

page 881 ANSWERS EXERCISE 21D, question 9 b iii, should read:

9 b i \[
\frac{3e^{x-1}}{2 \ln 3} + c
\]

ii \[
\frac{5-x}{\ln 5} + c
\]

iii \[
\frac{2e^x}{5 \ln 2} + \frac{7}{2} \ln 7 + c
\]

page 883 ANSWERS EXERCISE 21F, question 21, should read:

21 \[
\frac{2}{\sqrt{4ac-b^2}} \arctan \left( \frac{2ax+b}{\sqrt{4ac-b^2}} \right) + d \quad \text{if} \quad b^2 < 4ac,
\]

\[
\frac{1}{\sqrt{b^2-4ac}} \ln \left| \frac{2ax+b-\sqrt{b^2-4ac}}{2ax+b+\sqrt{b^2-4ac}} \right| + d \quad \text{if} \quad b^2 > 4ac,
\]

\[-\frac{2}{2ax+b} + d \quad \text{if} \quad b^2 = 4ac.
\]

page 883 ANSWERS REVIEW SET 21A, questions 16 f and 17 b, should read:

16 a \[
\frac{1}{2} \ln |x^2 + 4x| + c
\]

b \[
e^{x^2-1} + c
\]

c \[
e^{\frac{1}{10} \sin^{10} x} + c
\]

d \[
-\frac{1}{7} \ln |\cos 2x| + c
\]

e \[
e^{\sin x} + c
\]

f \[
\frac{1}{2}(\text{arcsin } x)^2 + c
\]

17 a \[
-\frac{32}{3} (4-x)^2 + \frac{16}{5} (4-x)^2 - \frac{2}{7} (4-x)^2 + c
\]

b \[
-x - 6 \ln |2-x| - \frac{12}{2-x} + \frac{4}{(2-x)^2} + c
\]

c \[
\frac{2}{3} (x + 2)^2 - (x + 2) - 2\sqrt{x + 2} + 2 \ln (\sqrt{x + 2} + 1) + c
\]

page 885 ANSWERS EXERCISE 22C, question 12 f, should read:

12 a \[
\frac{1}{2} \text{ units}^2
\]

b \[
(e-1) \text{ units}^2
\]

c \[
\frac{4}{5} \text{ units}^2
\]

d \[
18 \text{ units}^2
\]

e \[
\left(2c - \frac{2}{c} \right) \text{ units}^2
\]

f \[
\frac{\ln 3 - 1}{\ln 3} \text{ units}^2
\]

g \[
\frac{3}{5} \text{ units}^2
\]

h \[
4 \arctan \frac{2}{5} \text{ units}^2
\]

page 887 ANSWERS EXERCISE 22I, question 2 c, should read:

2 a \[
\frac{1}{4} \text{ units}^2
\]

b \[
\frac{1}{2} \text{ units}^2
\]

c \[
\frac{1}{\ln 3} \text{ units}^2
\]

page 888 ANSWERS REVIEW SET 22B, question 17 a, should read:

17 a \[
3(\ln 3 + \ln 2 - 1) \text{ units}^2
\]

b \[
\left(3 \sqrt[3]{4} - \frac{3}{4} \right) \text{ units}^2
\]

page 888 ANSWERS EXERCISE 23B.1, question 3 e, sign diagrams should terminate at t = 10:

3 e i \[
\begin{align*}
&-1 \quad + \\
&0 \quad 6 \quad 10 
\end{align*}
\]

ii \[
\begin{align*}
&-1 \quad + \\
&0 \quad 3 \quad 9 \quad 10 
\end{align*}
\]

\[e(t)\]

\[v(t)\]
At \( t = 5 \) s, the stone is 367.5 m above the ground and moving upward at 49 m s\(^{-1}\). It has acceleration \(-9.8\) m s\(^{-2}\).

At \( t = 12 \) s, the stone is 470.4 m above the ground and moving downward at 19.6 m s\(^{-1}\). It has acceleration \(-9.8\) m s\(^{-2}\).

\[ t > \frac{1}{2} \quad \text{ii} \quad 0 \leq t < \frac{1}{2} \quad \text{e} \quad \frac{4}{25} \text{ cm s}^{-2} \]

This result agrees with the identity \( \sin(x + \frac{\pi}{2}) = \cos x \).

\[ e^{-x^2} = \sum_{k=0}^{\infty} \frac{(-1)^k x^{2k}}{k!} = 1 - x^2 + \frac{x^4}{2!} - \frac{x^6}{3!} + \ldots \]

\[ e^{-x^2} \cos x = 1 - \frac{1}{2} x^2 - x^3 + \frac{1}{24} x^4 + \frac{1}{2} x^5 + \frac{25}{288} x^6 - \frac{1}{16} x^7 - \frac{105}{3456} x^8 - \frac{119}{12096} x^9 - \ldots \]

\[ \text{sin } x \text{ has zeros } n\pi, \ n \in \mathbb{Z}. \]

\[ \frac{\text{sin } x}{x} \text{ has zeros } n\pi, \ n \in \mathbb{Z}, \ n \neq 0. \]

\[ \frac{\text{sin } x}{x} = 1 - \frac{x^2}{3!} + \frac{x^4}{5!} - \frac{x^6}{7!} + \ldots \quad \text{for all } x \in \mathbb{R}, \ x \neq 0 \]
2

\[ M_n(0) = 0.2506, \quad M_n(1) = 0.2506, \quad M_n(2) = 0.2506 \]

8 a i \( \cos^2 x = 1 - x^2 + \frac{1}{3}x^4 - \frac{2}{45}x^6 + \ldots \)

2 e \( Q = Ae^\frac{2t}{\sqrt{a}} \)

2 f \( Q = -\frac{2}{3} \pm \sqrt{1 + c} \)

2 d i \( \approx 924 \) rodents

ii \( \approx 23.0 \) years

iii \( 3000 \) rodents

4 b \( y = -x \ln \left( \frac{1}{x} + c \right) \)

2 d ii \( \approx 924 \) rodents

ii \( \approx 23.0 \) years

iii \( 3000 \) rodents

4 x = \( \pm \sqrt{2e} \)

4 b \( y = -x \ln \left( \frac{1}{x} + c \right) \)

7 a \( y = \left( \frac{1}{2}x + 2 \right)^2 \)

b \( y = e^{lnx-3} = \frac{(x+2)^2}{25(x-2)} \)

11 a \( \frac{dV}{dt} = k\sqrt{h} \)

b \( V = 2 \times 2 \times h, \quad \frac{dh}{dt} = \frac{k}{4} \sqrt{h} \)

10 a \( \approx 84.1\% \)

b \( \approx 87.9\% \)

10 b \( \approx 87.9\% \)

This erratum for 2 a was made in error, please disregard it.

This erratum for 2 a was made in error, please disregard it.

This erratum for 10 b was made in error, please disregard it.

The following erratum was made on 22/Oct/2019

13 USEFUL FORMULAE, COUNTING AND THE BINOMIAL THEOREM, first dot point should read:

**COUNTING AND THE BINOMIAL THEOREM**

- \( \binom{n}{r} = \begin{cases} \frac{n!}{r!(n-r)!}, & n \in \mathbb{Z}^+, \ r \in \mathbb{N}, \ r \leq n \\ \frac{n(n-1)(n-2) \ldots (n-r+1)}{r!}, & n \in \mathbb{Q}, \ r \in \mathbb{Z}^+, \text{ and } \binom{n}{0} = 1 \end{cases} \)
The following errata were made on 19/Sep/2019

page 285 EXERCISE 12E, question 7, part i was removed.

page 329 EXERCISE 13B, question 2, should read:

2 Show that the lines $L_1: x = 2 + 5p, \ y = 10 - 3p, \ z = 9 + 2p, \ p \in \mathbb{R}$
and $L_2: x = 3 + 4r, \ y = 7 + 10r, \ z = -3 + 5r, \ r \in \mathbb{R}$ are perpendicular.

page 361 REVIEW SET 13A, question 6 a ii, should read:

a Find, in terms of $i$ and $j$, the:
   i initial position vector of the yacht
   ii velocity vector of the yacht
   iii position vector of the yacht after $t$ hours, $t \geq 0$.

page 572 CHAPTER 21 SECTION D, blue box should read:

$\therefore \int (ax + b)^n \, dx = \frac{1}{a} \frac{(ax + b)^{n+1}}{(n+1)} + c \quad \text{for } n \neq -1, \ a \neq 0.$

page 593 EXERCISE 22A, question 16 c, should read:

16 c Solve $\int_0^a x \sec^2 x \, dx = \frac{a}{3}, \ 0 < a < \frac{\pi}{2}$ directly using technology.

page 614 EXERCISE 22G.2, question 1 a, should read:

1 Find the volume of the solid formed when the following are revolved through $2\pi$ about the $y$-axis:
   a $y = x^2, \ x \geq 0$, between $y = 0$ and $y = 4$
   b $y = \sqrt{x}$ between $y = 1$ and $y = 4$

page 614 EXERCISE 22G.2, question 3, should read:

3 A wooden bowl is made in the shape of a paraboloid by revolving the curve $y = \frac{1}{2}x^2, \ x \geq 0$, between $y = 0$ and $y = 4$ through $2\pi$ about the $y$-axis. Find the capacity of the bowl.

page 628 REVIEW SET 22B, question 22, should read:

22 Over the course of a day, the rate of solar energy being transferred into Callum’s solar panels is given by $E(t) = 2 \sin \left( \frac{\pi}{12} \right) t + \frac{1}{2} \sin \left( \frac{7\pi}{12} \right)$ kW where $t$ is the time in hours after midnight, $5 \leq t \leq 20$.

page 840 ANSWERS EXERCISE 12E, question 7, part i was removed.

page 873 ANSWERS REVIEW SET 18B, question 25 b, should read:

25 a $0 \leq x \leq \frac{\pi}{2}$ and $\frac{3\pi}{2} \leq x \leq 2\pi$
   b $f'(x) = -\frac{\sin x}{2\sqrt{\cos x}}$, increasing for $\frac{3\pi}{2} < x \leq 2\pi$,
      decreasing for $0 \leq x < \frac{\pi}{2}$

page 878 ANSWERS EXERCISE 20C, question 2 b, should read:

b The antiderivative of $e^{kx}$ is $\frac{1}{k} e^{kx}$, where $k \neq 0$ is a constant.