1. \( 2x^2 + 2x - 24 = 0 \), so we use \( a = 2, b = 2, c = -24 \) in the quadratic formula. Hence

\[
\begin{align*}
  x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
  &= \frac{-2 \pm \sqrt{2^2 - 4 \cdot 2 \cdot (-24)}}{2 \cdot 2} \\
  &= \frac{-2 \pm \sqrt{4 - (-192)}}{4} \\
  &= \frac{-2 \pm \sqrt{196}}{4} \\
  &= \frac{-2 + 14}{4} \text{ or } \frac{-2 - 14}{4} \\
  &= \frac{12}{4} \text{ or } \frac{-16}{4} \\
  &= 3 \text{ or } -4
\end{align*}
\]

(2) \( 3x^2 + 11x + 12 = 0 \), so we use \( a = 3, b = 11, c = 12 \) in the quadratic formula. Hence

\[
\begin{align*}
  x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
  &= \frac{-11 \pm \sqrt{11^2 - 4 \cdot 3 \cdot 12}}{2 \cdot 3} \\
  &= \frac{-11 \pm \sqrt{121 - 144}}{6} \\
  &= \frac{-11 \pm \sqrt{-23}}{6} \\
  \end{align*}
\]

Hence there is no solution.

(3) \( 3x^2 - 6x + 3 = 0 \), so we use \( a = 3, b = -6, c = 3 \) in the quadratic formula. Hence

\[
\begin{align*}
  x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
  &= \frac{-(-6) \pm \sqrt{(-6)^2 - 4 \cdot 3 \cdot 3}}{2 \cdot 3} \\
  &= \frac{6 \pm \sqrt{36 - 36}}{6} \\
  &= \frac{6 \pm \sqrt{0}}{6} \\
  &= \frac{6}{6} \\
  &= 1
\end{align*}
\]

2. Let \( P \) be the amount invested, \( r \) be the interest rate per time period, \( n \) be the number of time periods and \( F \) be the final value. In each case, \( P = 400 \). Then:

i. Interest compounds annually, so we use the rate and number of time periods given in the question.

Hence \( r = 5.0\% = 0.05 \) and \( n = 5 \), so \( F = 400 \times (1 + 0.05)^5 = 400 \times 1.05^5 \approx 510.51 \).

The final balance is $510.51.

ii. Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.

Hence \( r = 2.5\% = 0.025 \) and \( n = 10 \), so \( F = 400 \times (1 + 0.025)^{10} = 400 \times 1.025^{10} \approx 512.03 \).

The final balance is $512.03.

iii. Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.

Hence \( r = 1.3\% = 0.0125 \) and \( n = 20 \), so \( F = 400 \times (1 + 0.0125)^{20} = 400 \times 1.0125^{20} \approx 512.81 \).

The final balance is $512.81.

iv. Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.

Hence \( r = 0.4\% = 0.0042 \) and \( n = 60 \), so \( F = 400 \times (1 + 0.0042)^{60} = 400 \times 1.0042^{60} \approx 513.34 \).

The final balance is $513.34.

v. Interest compounds continuously, so \( F = 400e^{0.05 \times 5} = 400e^{0.25} \approx 513.61 \).

The final balance is $513.61.
3. i. $\log_{10} 16^{18} = 18$

ii. $27 = 3^3$, so $\log_3 27 = 3$

iii. $\frac{1}{9} = 3^{-2}$, so $\log_3 \frac{1}{9} = \log_3 3^{-2} = -2$. Hence the answer is $-2$.

iv. $1000 = 10^3$, so $\log_{10} 1000 = 3$

v. $\frac{1}{10000} = 10^{-4}$, so $\log_{10} \frac{1}{10000} = -4$

vi. $\ln e^{12} = 12$

vii. $\frac{1}{e^{18}} = e^{-18}$, so $\ln \frac{1}{e^{18}} = \ln e^{-18} = -18$. Hence the answer is $-18$.

4. \[ \begin{align*}
\text{Let } x &= \text{height ladder reaches on wall} \\
\text{y} &= \text{distance of ladder from base of wall} \\
\end{align*} \]

\[ \begin{align*}
a) \quad \sin 60^\circ &= \frac{\text{opp}}{\text{hyp}} \quad &b) \quad \cos 60^\circ &= \frac{\text{adj}}{\text{hyp}} = \frac{y}{4} \\
\sin 60^\circ &= \frac{x}{4} \quad &\therefore \quad y &= 4 \times \cos 60^\circ = 2 \text{m} \\
\therefore \quad x &= 4 \times \sin 60^\circ = 3.5 \text{m} \\
\end{align*} \]

c) \[ \begin{align*}
\sin 70^\circ &= \frac{\text{opp}}{\text{hyp}} \\
\sin 70^\circ &= \frac{x}{4} \\
\therefore \quad x &= 4 \times \sin 70^\circ = 3.76 \text{m} \\
\end{align*} \]

i. The ladder will not reach.
i. \(0 = -11x + 6\), so \(11x = 6\), so \(x = \frac{6}{11}\). Hence this is a vertical line, with \(x\) positive. Hence the matching graph is Graph B.

ii. \(2y + 8x^2 - 15 = -y + 13x^2 - 16\), so \(3y = 5x^2 - 1\). This equation includes an \(x^2\) term with a positive coefficient, so the graph is a parabola which turns upwards. Also, the \(y\)-intercept is negative. Hence the matching graph is Graph Q.

iii. \(y = e^{5x}\), which is a graph of exponential growth. Hence the matching graph is Graph K.

iv. \(-10y - x + 2 = 16y + 14\), so \(26y = -x - 12\). Hence this is a straight line, with negative gradient and negative \(y\)-intercept. Hence the matching graph is Graph J.

v. \(-x + 3 = 8y - 11x + 16\), so \(8y = 10x - 13\). Hence this is a straight line, with positive gradient and negative \(y\)-intercept. Hence the matching graph is Graph E.

vi. \(-10y + 10 = 14y + 6x^2 + 10\), so \(24y = -6x^2\). This equation includes an \(x^2\) term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the \(y\)-intercept is 0. Hence the matching graph is Graph S.

vii. \(-12y - 9x^2 + 8 = -9y + 7x^2 - 1\), so \(3y = -16x^2 + 9\). This equation includes an \(x^2\) term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the \(y\)-intercept is positive. Hence the matching graph is Graph R.

viii. \(-12x - 5 = 2\), so \(-12x = 7\), so \(x = \frac{-7}{12}\). Hence this is a vertical line, with \(x\) negative. Hence the matching graph is Graph A.