1. The following functions represent exponential growth or decay. For each function, first state the initial quantity. Second, by putting the function in the form \( P = A(1 + r)^t \), give \( r \): the percentage growth, or decay, rate.

(a) \( P = 3.2e^{0.03t} \)
(b) \( P = 15e^{-0.06t} \)
(c) \( P = 0.01e^t \)
(d) \( P = -2.4e^{-2t} \)

2. The growth rate in Australia in 2010 is 1.69\% per annum, and the population is approximately 21,374,000.

(a) Write a formula of the form \( P = Ae^{kt} \) for the population of Australia, \( P \), as a function of years, \( t \), since 2010.
(b) Use this formula to estimate the population in 2050.
(c) Use this formula to estimate the population in 1900.

3. Repeat the previous question with the following formula for the population: \( P = A(1 + r)^t \). Would you expect the answers to be similar? Explain your answer.

4. Mount Everest’s peak stands at 8,848m above sea level, and air pressure decays exponentially by 0.013\% every meter you travel above sea level. Using \( P(d) = P_0e^{kd} \), where \( P \) is air pressure, \( P_0 \) is the air pressure at sea level, and \( d \) is the height in meters above sea level, by what percentage is the air pressure reduced by moving from sea level to the peak of Mount Everest?

5. A sky diver jumps from a height where it can be shown that their downward velocity at time \( t \) is given by

\[ v(t) = 80(1 - e^{-0.2t}) \]

where \( t \) is measured in seconds and \( v(t) \) is measured in metres per second.

(a) Find the initial velocity of the sky diver.
(b) Find the velocity after 5 s and after 10 s.
(c) What is the velocity as \( t \to \infty \)? This will be what’s called the terminal velocity.

6. (*) Let \( f(t) = Q_0(1 + r)^t \), where \( Q_0 \) is the initial quantity, and \( r \) is the growth rate. Given that \( f(0.02) = 25.02 \) and \( f(0.05) = 25.06 \), find \( r \).

7. Identify the \( x \)-intervals on which the function graphed below is:

(a) Increasing and concave up
(b) Increasing and concave down
8. Find the following:
   (i) \( f(g(1)) \),
   (ii) \( g(f(1)) \),
   (iii) \( f(g(x)) \),
   (iv) \( g(f(x)) \),
   (v) \( f(x)g(x) \),

   where \( f(x) = e^x \) and \( g(x) = x^3 \).

9. For each of the following functions, decide whether it is even, odd, or neither.
   (a) \( f(x) = x^5 + x^3 + x \)
   (b) \( f(x) = x^3 + 1 \)
   (c) \( f(x) = x^{-2} \)
   (d) \( f(x) = x + \frac{1}{x} \)
   (e) \( f(x) = e^{x^2-2} \)

10. Graph the line \( y = 3x - 6 \). How would you alter the equation to move this line
    (i) vertically upwards 5 units?
    (ii) vertically downwards 2 units?
    (iii) horizontally 1 unit to the right?
    (iv) horizontally 2 units to the left?

11. Graph the parabolas given by the equations
    (i) \( y = (x - 2)^2 \)
    (ii) \( y = (-1)(x - 1)(x + 1) \)