Examples 1.3 – Derivatives of Linear Functions

1. Find the first and second derivatives of \( y = 4x + 1 \), \( g(t) = 3 - 5t \), and \( h(r) = 1.344 \).

   Solution:

2. The rate of change of the position over time of a moving object is its velocity \( v(t) \), and the rate of change of velocity over time is its acceleration \( a(t) \). If the position of an object after \( t \) minutes is given by \( s(t) = 65t + 20 \) cm, then what are its velocity and acceleration functions?

   Solution:

3. For each part, sketch an example of a (possibly nonlinear) graph having the given properties.

   (i) A constant derivative of two.
   (ii) A negative derivative at \( x = 1 \), and a positive derivative at \( x = 3 \).
   (iii) A zero derivative at \( x = -1 \), positive derivatives on the interval \((-1, 2)\), and a zero derivative at \( x = 2 \).

   Solution: