Complete solutions to Exercise 3(c)

1. (a) \( f(x) = 2x + 3 \)
   \( f(x) \)

(b) \( f(I) = 2.54I \)

(c) \( f(t) = -9.8t \)

2. Graphs \( f(x) = x^2 \) and \( g(x) = -x^2 \) are sketched in Fig 18 of Chapter 2. The graphs are reflections of each other in the horizontal axis.

3. Notice that \( (x+1)^2 = x^2 + 2x + 1 \) (by (1.13)). Therefore (i) and (ii) are the same graphs. The \( (x+1)^2 \) graph is the same shape as the \( x^2 \) graph but it has been shifted to the left by 1 unit, thus:

4. (a) \( f(r) = \pi r^2 \)
   \( g(r) = r^2 \)
   \( f(v) = v^2 \)
   \( g(v) = v^2/20 \)

\[ (a + b)^2 = a^2 + 2ab + b^2 \]
The \( f \) graph is a stretch of the \( g \) graph (or vice-versa).

5. (a) \[ y = x \]
(b) \[ y = x \]

(c) \[ y = x \]

6. Substituting \( L = 0.1 \) gives \( w(i) = \left( \frac{1}{2} \times 0.1 \right) i^2 = 0.05i^2 \). Hence the graph:

\[ w(i) = 0.05i^2 \]

7. The graph of \( 2v^2 - 3 \) is similar in shape to the graph of \( v^2 \). The \( v^2 \) graph is stretched vertically by 2 and shifted down by 3 to give us the \( 2v^2 - 3 \) graph. Where does \( i(v) = 2v^2 - 3 \) cross the \( v \) axis?

At \( i(v) = 0 \),
\[
2v^2 - 3 = 0 \\
2v^2 = 3 \\
v^2 = \frac{3}{2} \\
v = \sqrt{\frac{3}{2}}, -\sqrt{\frac{3}{2}}
\]

Hence the \( 2v^2 - 3 \) graph cuts the \( t \) axis at \( \sqrt{\frac{3}{2}}, -\sqrt{\frac{3}{2}} \) and the \( i(v) \) axis at \( -3 \), thus the graph is:
8. The graph of \( i(R) = \frac{1}{R + 5} \) is similar to the graph of \( \frac{1}{R} \). How do we adjust the graph of \( \frac{1}{R} \) to sketch \( i(R) = \frac{1}{R + 5} \)?

Shift \( \frac{1}{R} \) to the left by 5 units. Thus we have:

![Graph of \( i(R) = \frac{1}{R + 5} \)](image)

9. The graph of \( x(t) = (t - 1)^3 \) is similar in shape to the \( t^3 \) graph. How do we adjust the \( t^3 \) graph to obtain a sketch of \( x(t) = (t - 1)^3 \)?

Shift the graph of \( t^3 \) to the right by 1 unit.

For (b) and (c) we stretch the resulting graph, \( (t - 1)^3 \), vertically by a factor of 5 for \( 5(t - 1)^3 \) graph and a factor of \( \frac{1}{2} \) for \( \frac{1}{2}(t - 1)^3 \) graph.

![Graph of \( x(t) = (t - 1)^3 \)](image)