Higher Exercise 3

1. A straight line passes through points E(4, -1) and F(-2, 3).

   Find the equation of the perpendicular bisector of EF.

2. The functions f and g, defined on suitable domains, are given by $f(x) = 2x^2 + x$ and $g(x) = x - 2$.

   Find a simplified expression for $f(g(x))$.

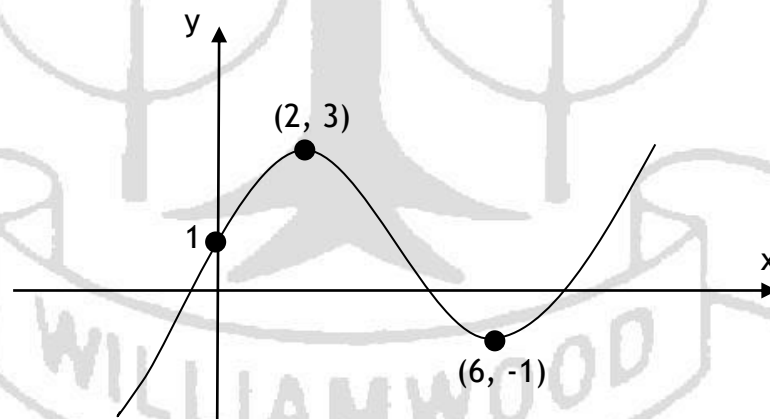3. A sequence is defined by the recurrence relation $U_{n+1} = 0.7U_n + 1$ where $U_1 = 0$.

   a. Calculate the value of U_2 and U_3.
   b. Explain why the sequence above has a limit.
   c. Find the limit of this sequence when $n \rightarrow \infty$.

4. The functions p and q are defined on suitable domains by $p(x) = \dfrac{2}{x}$ and

   $q(x) = \dfrac{2}{2-x}$.

   a. If $h(x) = q(p(x))$, find a simplified expression for $h(x)$.
      Give your answer as a single fraction.
   b. Hence, state a suitable domain for the function $h(x)$.

5. The diagram below shows the graph of $y = f(x)$.

   Sketch the graphs of   i. $y = f(x - 1) - 2$;
                          ii. $y = -3(f(x))$.