Higher Homework 4 – Functions and Vectors
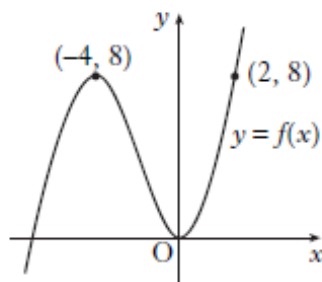
1. The functions f and g, defined on suitable domains, are given by

$$f(x) = \frac{1}{x^2} \qquad \text{and } g(x) = 2x - 1$$

    (a) Find an expression for h(x) = f(g(x))   3

    (b) State a suitable domain for the function h(x)   1

    (c) Determine an expression for the inverse function $g^{-1}(x)$ 1

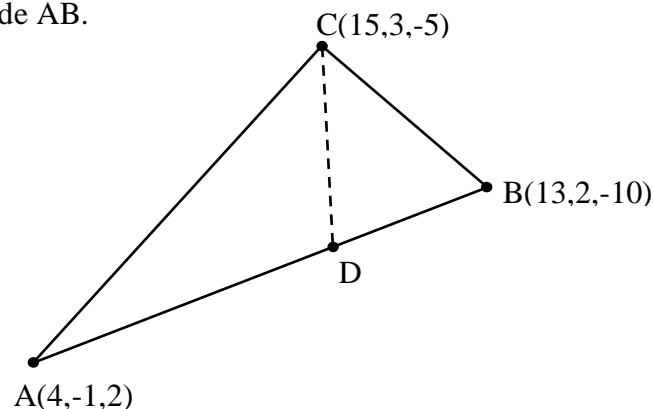2. The diagram shows the graph of function $y = f(x)$

Sketch
    (a) $y = f(2x)$
    (b) $y = 1 - f(2x)$

    5

3. Triangle ABC has vertices A(4,-1,2), B(13,2,-10) and C(15,3,-5) as shown.

    Point D lies on side AB.

    (a) Given that D divides the line AB in the ratio 2:1, show that D
           has coordinates (10, 1, –6).   **3**

    (b) Hence calculate the size of angle CDA.   **5**

4. What value of x makes the vectors

$$\begin{pmatrix} -2 \\ 4 \\ 10 \end{pmatrix} \text{ and } \begin{pmatrix} -3 \\ 6 \\ x \end{pmatrix} \text{ perpendicular to each other?} \qquad \mathbf{3}$$