Edexcel A level Mathematics Functions

Topic assessment

1. The functions f, g and h are defined as follows:
$$f(x) = e^x \qquad x \in \mathbb{R}$$
$$g(x) = \sqrt{x} \qquad x \geq 0$$
$$h(x) = 2x + 1 \qquad x \in \mathbb{R}$$

   Find each of the following functions, giving the domain and range of each.
   (i)   fg(x)   (ii) gh(x)   (iii) hf(x)   [9]
   (iv) $f^{-1}(x)$ (v) $h^{-1}(x)$ [6]

2. (i) Sketch the graph of $y = |2x + 1|$.   [2]

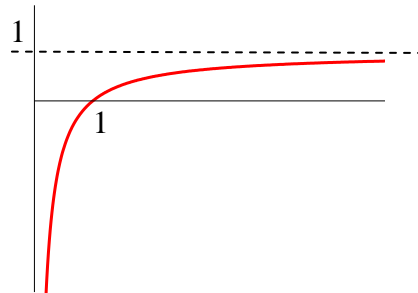   (ii) Hence, or otherwise, solve each of the following equations:

   (a) $|2x + 1| = 3 - x$ [3]

   (b) $|2x + 1| = 3x - 2$ [3]

3. The diagram below shows the graph $y = f(x)$, where $f(x) = \dfrac{x-1}{x}$ for $x > 0$.

   The graph approaches the line $y = 1$ as x becomes very large.

   (i)   Write down the domain and range of f(x).   [2]
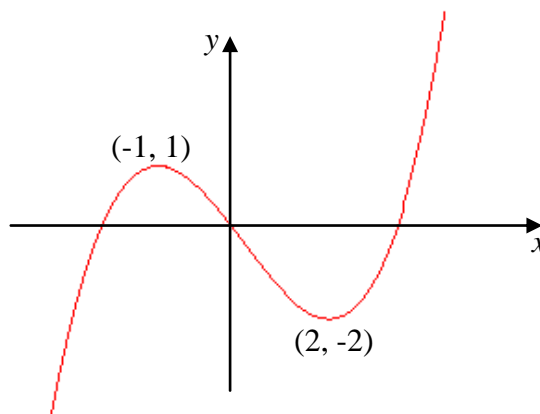   (ii)   Find the inverse function $f^{-1}(x)$.   [3]
   (iii) Write down the domain and range of $f^{-1}(x)$.   [2]
   (iv)   Sketch the graph of $y = f^{-1}(x)$ for the domain you gave in (iii). [2]
   (v)   What is the relationship between the graph of $y = f(x)$ and the graph of
          $y = f^{-1}(x)$?   [1]

4. The graph of a function $y = f(x)$ is shown below. The graph has a local maximum
   at $(-1, 1)$ and a local minimum at $(2, -2)$.

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Sketch the graphs of:

(i) $y = 3f(2x)$ [3]

(ii) $y = 2f(x-1)$ [3]

(iii) $y = f(2x) - 1$ [3]

(iv) $y = f(-x) + 1$ [3]

giving the coordinates of the turning points in each case.

5. (i) Solve the inequality $|3x - 2| \leq 4$.   [3]

     (ii) Write the inequality $-2 < x < 7$ in the form $|x - a| < b$.   [2]

Total 50 marks