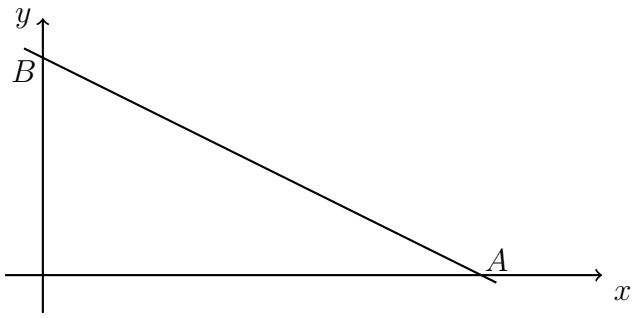
**4.11 Exam: Linear equations, function operations, regression**

1. [Maximum mark: 6]

The diagram shows the straight line $L_1$, which intersects the $x$-axis at $A(k, 0)$ and the $y$-axis at $B(0, 3)$.

**diagram is not to scale**




The gradient of $L_1$ is $-\frac{3}{4}$.

(a) Write down the equation of the line $L_1$. [1]

(b) Find the value of $k$. [2]

(c) The line $L_2$ is perpendicular to $L_1$ and passes through $(2, 1)$.

i. Write down the gradient of the line $L_2$. [1]

ii. Hence, write down the equation of $L_2$. Leave your answer in the form $y - a = m(x - b)$. [2]

2. [Maximum mark: 7]

Let $f(x) = 2x + 8$ and $g(x) = \sqrt{x} - 1$, for $x \geq 0$.

(a) Write down $g(9)$. [1]

(b) Find $(f - g)(x)$. [1]

(c) Find $(g \circ f)(4)$. [1]

(d) Write down $g^{-1}(4)$. [2]

(e) Find $f^{-1}(x)$. [2]

**Working:**

**Answers:**

(a) .....

(b) .....

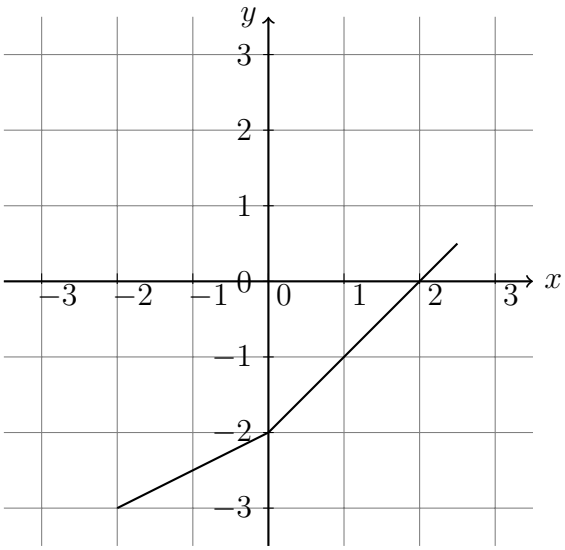
(c) .....

(d) .....

(e) .....

3. [Maximum mark: 6]

Early finishers: The diagram below shows the graph of a function $f$ for $-2 \leq x \leq 2.5$.




(a) Write down the value of $f(2)$. [1]

(b) Write down the value of $f^{-1}(-1)$. [2]

(c) Sketch the graph of $f^{-1}$ on the grid. [3]

**Working:**

**Answers:**

(a) .....

(b) .....

4. [Maximum mark: 6]

The following table shows the Diploma score $x$ and university entrance mark $y$ for seven IB Diploma students.

| Diploma score ($x$) | 28 | 30 | 27 | 31 | 32 | 25 | 27 |
|---|---|---|---|---|---|---|---|
| University entrance mark ($y$) | 73.9 | 78.1 | 70.2 | 82.2 | 85.5 | 62.7 | 69.4 |

(a) Find the correlation coefficient. [2]

The relationship can be modelled by the regression line with equation $y = ax + b$.

(b) Write down the value of $a$ and of $b$ [2]

Rita scored a total of 26 in her IB Diploma.

(c) Use your regression line to estimate Rita's university entrance mark. [2]

**Working:**

**Answers:**

(a) .....

(b) .....

(c) .....