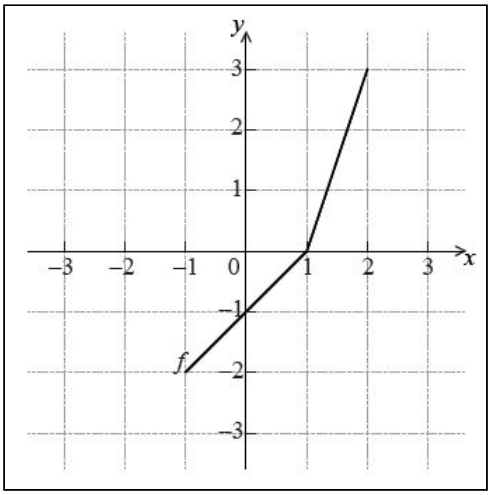
1. **(T2.2, T2.5, R, CI)** Let $f(x) = \sqrt{x-5}$ for $x \geq 5$. *(Cirrito, 5.4.1 p.148; Cirrito, 5.4.2 p.157)*

   a. Find $f^{-1}(2)$. *[3 marks]*
   b. Let $g(x)$ be a function such that g^{-1} exists for all real numbers. Given that $g(30) = 3$, find $f \circ g^{-1}(3)$. *[3 marks]*

2. **(T2.11, R, CI)** The diagram shows the graph of a function, f, for $-1 \leq x \leq 2$
   (Cirrito 6.1, p167; Cirrito 6.2, p177; Cirrito 6.3, p183)



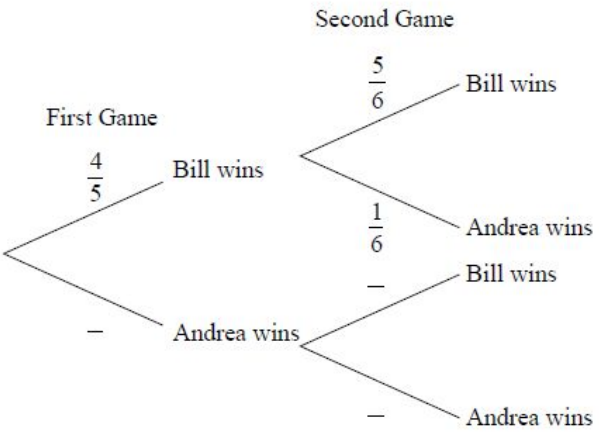
   a. Write down the value of $f(2)$. *[1 mark]*
   b. Write down the value of $f^{-1}(-1)$. *[2 marks]*
   c. Sketch the graph of $f^{-1}(x)$ on the grid above. *[3 marks]*

3. **(T2.6, R, CI)** Let $g(x)$ be a quadratic function such that $g(0) = 5$. The line $x = 2$ is the axis of symmetry of $g(x)$. *(Cirrito 2.4.2, p44)*

   a. Find $g(4)$. *[3 marks]*
   b. The function g can be expressed in the form $g(x) = a(x-h)^2 + 3$. *[4 marks]*
      i. Write down the value of h.
      ii. Find the value of a.

4. **(T4.6, R, CI)** Bill and Andrea play two games of tennis. The probability that Bill wins the first game is $\frac{4}{5}$. If Bill wins the first game, the probability that he wins the second game is $\frac{5}{6}$. If Bill loses the first game, the probability that he wins the second game is $\frac{2}{3}$. *(Oxford, 3.5, p89)*

   a. Complete the following tree diagram. *[3 marks]*



   b. Find the probability that Bill wins the first game and Andrea wins the second game. *[2 marks]*

   c. Find the probability that Bill wins at least one game. *[2 marks]*

5. **(T2.6, R, CI)** Let $f(x) = x^2 + x - 6$. *(Cirrito. 2.4.2 p.44)*

   a. Write down the *y*-intercept of the graph of *f*. *[1 mark]*
   b. Solve $f(x) = 0$. *[3 marks]*
   c. Sketch the graph of *f*, for $-4 \leq x \leq 3$. *[3 marks]*

6. **(T1.9, N, CA)** Given the binomial expression $(2x + \frac{1}{x})^6$ determine the value of the constant term (that is, the term without an *'x'* in it) *[4 marks]* *(Cirrito, 4.1 p.95)*

7. **(T3.6, E, CI)** A Ferris wheel with diameter 122 metres rotates clockwise at a constant speed. The wheel completes 2.4 rotations every hour. The bottom of the wheel is 13 metres above the ground. A seat starts at the bottom of the wheel. *(Cirrito, 10.5 p.361)*

   a. Find the maximum height above the ground of the seat. *[2 marks]*
   b. After ***t*** minutes, the height *h* metres above the ground of the seat is given by $h(t) = 74 + a\cos(bt)$. *[2 marks]*
      i. Show that the period of $h(t)$ is 25 minutes.
      ii. Write down the **exact** value of *b*.
   c. Find the value of *a* . *[3 marks]*
   d. Sketch the graph of $h(t)$, for $0 \leq t \leq 50$. *[4 marks]*
   e. In one rotation of the wheel, find the probability that a randomly selected seat is at least 105 metres above the ground. *[5 marks]*