Functions and straight-line graphs - Practice test 4

Name: _____ Date: _____

10 questions | 44 marks | 70 minutes

A reasoning paper with parameter restrictions, a shifted reciprocal rule and geometric modelling.

A scientific calculator may be used.

1. The linear function f satisfies $f(-1) = -5$ and $f(3) = 7$. [4 marks]

(a) Find the rule $f(x)$. [2 marks]

(b) Compare $f(2t)$ with $2f(t)$. Are they equal for all t? [2 marks]

2. Let $h(x) = \sqrt{10 - 2x}$. [4 marks]

(a) Find the real domain and range without a contextual restriction. [2 marks]

(b) Now restrict $0 \leq x \leq 5$. Find the new range. [2 marks]

3. Consider the line $3y - 6x = 15$. [4 marks]

(a) Find its gradient and its two intercepts. [2 marks]

(b) A student says $y = 2x + 1$ is perpendicular to it because the intercepts differ. Correct the statement. [2 marks]

4. For a real number p, two points are $A(p, 1)$ and $B(p, 6)$. [4 marks]

(a) State the equation and gradient of AB. [2 marks]

(b) Find the line perpendicular to AB through $(0, -3)$. [2 marks]

5. A laboratory mixes 10% and 30% saline solutions to make 20 L of a 22% solution. Assume volumes add. [5 marks]

(a) Form equations for the litres x and y of the two solutions. [2 marks]

(b) Solve and check the mixture. [3 marks]

6. Three points are $A(-4, 1)$, $B(2, 9)$, $C(2, 1)$. [4 marks]

(a) Calculate all three side lengths. [2 marks]

(b) Explain why the triangle is right-angled and find the midpoint of AB. [2 marks]

7. A shifted reciprocal rule is $y = \frac{6}{x-2} + 1$. [5 marks]

(a) State the asymptotes, domain and range. [2 marks]

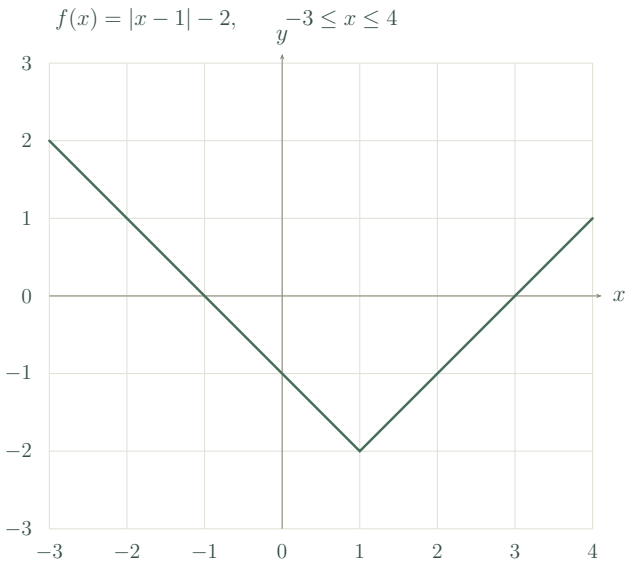
(b) Find both axis intercepts. [3 marks]

8. A circle has centre $(-2, 1)$ and passes through $(1, 3)$. [5 marks]

(a) Write its equation. [2 marks]

(b) Find its exact x-intercepts. [3 marks]

9. A V-shaped function is $f(x) = |x - 1| - 2$ on $-3 \leq x \leq 4$. Here $|u|$ means the non-negative distance of u from zero. [4 marks]



(a) Find its minimum point and its range. [2 marks]

(b) Does its repeated output at $x = 0$ and $x = 2$ prevent it being a function? Explain. [2 marks]

10. A linear taxi tariff charges 17.50 dollars for 5 km and 27.50 dollars for 9 km. [5 marks]

(a) Find a fare rule $C(d)$, explaining both coefficients. [2 marks]

(b) What is the greatest distance costing at most 25 dollars under this tariff? [3 marks]