

Name:

Instructions:

- Attempt all questions.
- The test is out of 100 marks.
- There are 10 questions worth 10 marks each.
- You have 65 minutes to complete the test.

Advice:

- Budget your time—spend about 5 minutes on each problem.
- First, do those questions which you know how to do immediately.
- Leave questions which you find difficult until last.
- Ask for clarification if you do not understand a question.
- You must show your work.

Good Luck!

Problem 1. (5+5=10 marks) Determine the domain of the functions

(a) $f(x) = \sqrt{8 - x}$

(b) $f(x) = \frac{\sqrt{8 - x}}{x - 3}$

Problem 2. (5+5=10 marks) Determine whether the following functions are even, odd, or neither. Use the algebraic technique to determine if a function is even or odd, rather than attempting to sketch the function.

(a) $g(x) = x^6 + x^2$

(b) $h(x) = 45 - \frac{1}{x}$

Problem 3. (10 marks) Find a formula $f^{-1}(x)$ for the inverse of the function (you do not have to discuss domain and range):

$$f(x) = \frac{1 + 3x}{5 - 2x}$$

Problem 4. (10 marks) Find an algebraic expression for the function that is found from $y = f(x)$ by shifting to the right by 5 units, then compressing horizontally by 3 units, and then reflecting about the y -axis. Show each step in constructing the final function.

Problem 5. (10 marks) Find the equation of the straight line passing through the points $(-3, -7)$ and $(5, -11)$. Your answer should be in slope-intercept form.

Problem 6. (10 marks) Sketch a graph of your own choosing that satisfies the following conditions,

- (i) it is bounded below but unbounded above,
- (ii) it has a horizontal asymptote $y = -3$,
- (iii) it has a discontinuity at $x = 2$,
- (iv) it has a local minimum at $x = 5$,
- (v) it has domain $x \in \mathbb{R}$.

Problem 7. (10 marks) Sketch the graph of the piecewise defined function f , and label any points of interest.

$$f(x) = \begin{cases} -3 - x & \text{if } x \leq 0 \\ 1 & \text{if } x > 0 \end{cases}$$

Problem 8. (5+5=10 marks) Given the functions $f(x) = x^2 - 4$ and $g(x) = \sqrt{x+1}$, determine the following compositions (simplify as much as possible). You do not have to discuss domains.

(a) $(f \circ g)(x)$

(b) $(g \circ f)(x)$

Problem 9. (10 marks) Given below is a sketch of the function $f(x) = x^2$. Using what we've learned about translating a graph, draw a sketch of the function $g(x) = (x-1)^2 + 4$ (you can add it directly to the sketch below if you like).

Problem 10. (10 marks) Match the function with the corresponding graph by considering end behaviour and asymptotes. Show your work.

(a) $y = \frac{x^3 + 2}{2x^2 + 1}$ (b) $y = \frac{x^2 + 2}{2x + 1}$ (c) $y = \frac{x + 2}{2x^2 + 1}$ (d) $y = \frac{x + 2}{2x + 1}$

