
Name:

Instructions:

- Attempt all questions.
- The test is out of 100 marks.
- There are 10 questions, 10 marks each.
- You have 60 minutes to complete the test.
- You may use calculators on this test.

Advice:

- Budget your time.
 - Do questions which you know how to do immediately first.
 - Leave questions which you find difficult until last.
 - Ask for clarification if you do not understand a question.
 - You must show your work. Label sketches well.
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Problem 1. (5+5=10 marks) Determine the domain of the functions

(a) $f(x) = \sqrt{x - 7}$

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

Problem 2. (10 marks) Draw a well labelled arrow diagram for the composition of two functions, where f has domain A and range B and g has domain D and range R : $(f \circ g)(x) = f(g(x))$.**Problem 3.** (10 marks) Given $f(x) = x^2$, simplify the quantity $f(x+h) - f(x-h)$ as much as possible.

Problem 4. (10 marks) Determine whether the following function is even, odd, or neither. Use the algebraic technique to determine if a function is even or odd, rather than attempting to sketch the function.

$$g(x) = \frac{x^3 - x}{x^3 + x}$$

Problem 5. (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 6. (10 marks) Sketch a graph of your own choosing that satisfies the following conditions,

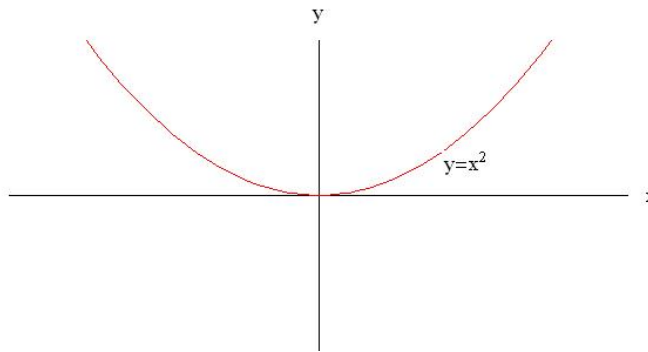
- (i) it is bounded below but unbounded above,
- (ii) it has a vertical asymptote $x = 12$,
- (iii) it has a discontinuity at $x = 2$,
- (iv) it has an absolute minimum of -5 at $x = 5$,
- (v) it has domain $-5 \leq x < 12$.

Problem 7. (10 marks) Sketch the graph of the piecewise defined function f , and label three (x, y) ordered pairs on the graph

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

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

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) Given below is a sketch of the function $y = f(x)$. Add to this a sketch of the inverse function $y = f^{-1}(x)$. Label one (x, y) ordered pair on the inverse function.

