
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)(a) Determine the domain of the function $f(x) = \frac{4}{\sqrt{8-5x}}$ (b) Given $w(t) = \frac{45-8t^2}{\sqrt{8+4t^6}}$, what function does the function $w(t)$ approach as $t \rightarrow \infty$? (end behaviour)

Problem 2. (10 marks) Draw a well labelled arrow diagram for the addition of two functions, where f has domain A and range B and g has domain D and range R : $(f+g)(x) = f(x) + g(x)$. Clearly indicate in your diagram what the domain of $f+g$ is.

Problem 3. (10 marks) Given $f(x) = \frac{x^2 - 2}{3}$, simplify the quantity $f(x + h) - f(x - h)$ as much as possible.

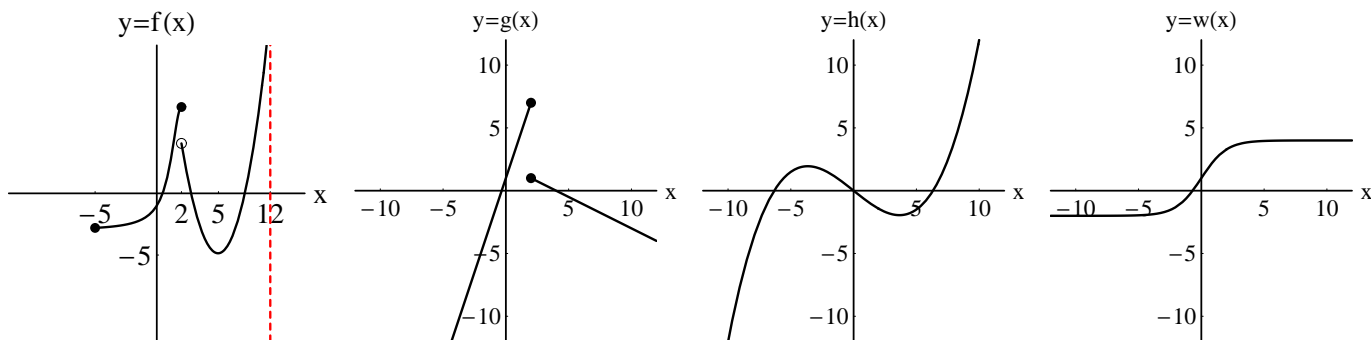
Problem 4. (10 marks) Determine whether the following function is even, odd, or neither. Use the algebraic technique to determine if a function is even or odd, rather than attempting to sketch the function.

$$g(x) = \frac{x^3 - x}{x^4 + 1}$$

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):

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

Problem 6. (10 × 1 = 10 marks) Answer questions (i)–(x) based on the following graphs.



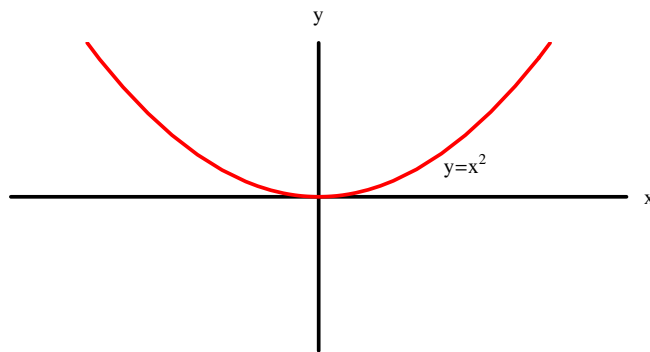
- (i) $f(x)$ is continuous for $x \in [2, 12]$ T F
- (ii) $f(x)$ has a vertical asymptote given by $y = 12$ T F
- (iii) $f(x)$ is a function with domain $x \in [-5, 12)$ T F
- (iv) $f(-5) = 5$ T F
- (v) $g(x)$ is not a function T F
- (vi) $h(-x) = -h(x)$ T F
- (vii) $h(x)$ is an even function T F
- (viii) $h(x)$ is a one-to-one function T F
- (ix) $w(x)$ is bounded above and bounded below T F
- (x) $w(x)$ has two horizontal asymptotes T F

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

$$f(x) = \begin{cases} -2 - 2x & \text{if } x > 0 \\ -|x| & \text{if } x \leq 0 \end{cases}$$

Problem 8. (10 marks) Given the functions $f(x) = x^4 - x^2$ and $g(x) = \sqrt{x^{3/2} - x}$, 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.

