



Name: _____

Mark:
25

MATH 100 Assignment 2

1. (1 mark) Evaluate the limit. If it does not exist, then determine whether it is ∞ or $-\infty$ or neither.

$$\lim_{x \rightarrow 2\pi^+} \frac{x}{\sin(x - \pi)}$$

2. (2 marks) Let $f(x) = \frac{x^2 - 9}{x^3 - x^2 - 6x}$.

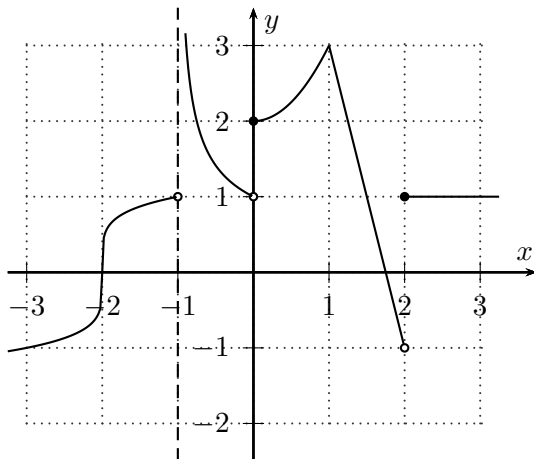
(a) Find the equations of all vertical asymptotes (if any) of f .

(b) Find the limit of $f(x)$ at all removable discontinuities (if any) of f .

3. (3 marks) Use the **limit definition** of a derivative to find $f'(x)$, where $f(x) = \frac{2}{x^2 + 4}$.

4. (2 marks) Use the alternative form of the derivative, $f'(c) = \lim_{x \rightarrow c} \frac{f(x) - f(c)}{x - c}$, to find $f'(3)$ for the function $f(x) = \sqrt{2x + 19}$.

5. (2 marks) Consider the graph of the function $f(x)$ given below.



- (a) List all of the x -values at which f is **not** continuous. _____
- (b) List all of the x -values at which f is **not** differentiable. _____
- (c) Evaluate $f'(5/2)$ and $f'(3/2)$ by relating these derivative values to the slope of the graph.
6. (2 marks) Differentiate by using basic derivative rules, but **not** the product or quotient rules. Simplify your answer by expressing it in the form of a single fraction using only positive exponents (i.e. in a form similar to how y itself is written).

$$y = \frac{7x^{3/2} - 12x + 2}{6\sqrt{x}}$$

7. (2 marks) Find the derivative of $g(t) = \frac{4t^2 - t + 6}{2t^2 + 3}$.

8. (3 marks) Find the equation of the tangent line to the curve $y = 8x \tan x$ at $x = \pi/4$. Write your answer in slope-intercept form.

9. (2 marks) The position function (measured in meters) of a particle is given by

$$s(t) = 2t^3 - 9t^2 - 50t,$$

for $t \geq 0$, where t is measured in seconds. When does the particle reach a velocity of 10 m/s?

10. (1 mark) Let $f(x) = \cos x$. Find $f^{(100)}(x)$, the 100th derivative of $f(x)$.

11. (2 marks) Find the equation of the tangent line to the curve $y = \sqrt{x^2 + 22x - 7}$ at $x = 1$.

12. Differentiate the following functions. Simplify your answers.

(a) (1 mark) $y = 5 \sec^2(7\theta + 4)$

(b) (2 marks) $f(x) = \frac{x^2 - 9}{(6 - x^2)^{2/3}}$