

1. [15] 2. [15] 3. [10] 4. [10] 5. [10] 6. [10] 7. [15] 8. [15] Total: [100]

Math 224

Exam 1
(V.1 White)

Sept 19, 2016

Name:

Section:

Closed book and closed notes.

Answers must include supporting work.

Calculators and cell phones out of sight.

1. (15 pts) Solve the following inequalities. Display your answer in interval notation.

a) $|2 + 3x| \leq 3$

b) $x^2 + 3x - 10 \geq 8$

2. (15 pts) Find the limit if it exists. If the limit doesn't exist explain why. **Using L'Hopital's Rule will not receive credit.**

a) $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^2 + x - 6}$

b) $\lim_{x \rightarrow 1} \frac{2 - x}{(x - 1)^2}$

c) $\lim_{x \rightarrow 0} \frac{\sin(5x)}{\sin(8x)}$

3. (10 pts) Use the Intermediate Value Theorem to show there is a root for the equation $x^5 - x^3 + 3x - 5 = 0$ between 1 and 2.

4. (10 pts) Find the equation of the tangent line to the curve $y = x^2 - 2x + 3$ at $x = -1$.

5. (10 pts) Find the derivative of $f(x) = \frac{1}{x+2}$ using the definition of derivative.

6. (10 pts) Find each x -value at which f is discontinuous. Explain your answer fully using left and right-hand limits.

$$f(x) = \begin{cases} x+2 & \text{if } x < 0 \\ 2x^2 & \text{if } 0 \leq x \leq 1 \\ 3-x & \text{if } x > 1 \end{cases}$$

7. (15 pts) Find $\frac{dy}{dx}$ for the following:

a) $y = ax^2 + \frac{b}{\sqrt{x^3}} + c$

b) $y = \sin \sqrt{x^2 + 1}$

c) $y = \tan(5x) \cos x$

8. (15 pts) Let $f(x) = \frac{x^2 - 1}{|x - 1|}$.

Write the above function $f(x)$ as a piecewise function and find the following if they exist:

a) $\lim_{x \rightarrow 1^-} f(x)$, $\lim_{x \rightarrow 1^+} f(x)$, and $\lim_{x \rightarrow 1} f(x)$.

b) Sketch $f(x)$.

c) Where is $f(x)$ continuous? Where is it differentiable?

d) Sketch $f'(x)$.