

Math 125: Practice Exam 1

These problems are meant to signify the kinds of questions that you are likely to encounter on our midterm Friday. These problems are by no means exhaustive, and you should use this in conjunction with your class notes and old quizzes to study for the exam. You will be permitted the use of a calculator for arithmetic and basic functions only.

- (a) Draw the graph of $y = 9 - x^2$
(b) Draw the graph of the equation $y = -2(9 - x^2) + 5$
- Suppose that a population is given by the continuous function $f(x) = x^3 - 25x$, where x is measured in years since 2000. Find the average rate of growth from $x = 10$ to $x = 10.1$. Find the average rate of growth from $x = 10$ to $x = 10.01$ and the average rate of growth from $x = 10$ to $x = 10.001$ and estimate the instantaneous rate of growth at $x = 10$. Check that your answer makes sense by calculating $f'(10)$.

- Calculate

$$\lim_{x \rightarrow 3} \left[\frac{2x}{x^2 - 1} - \frac{1}{x - 1} \right]$$

by first taking a common denominator.

- Calculate

$$\lim_{x \rightarrow 0} \frac{\sin(4x)}{x}$$

by examining appropriate values on either side of 0.

- Calculate

$$\lim_{x \rightarrow \infty} \frac{\sqrt{2x^2 + 5x}}{\sqrt[3]{8x^3 - 2}}$$

- Suppose that

$$f(x) := \begin{cases} 4 - x^2 & x \leq 2 \\ x - 1 & x > 2 \end{cases}$$

Is $f(x)$ continuous at $x = 2$? Give a careful explanation (ie, using careful mathematical notation) as to why or why not.

- (a) Given a function $f(x)$, give the definition of its derivative, $f'(x)$.
(b) Use your definition to find the derivative of $f(x) = \sqrt{1 - x}$.
- The height of a rocket fired when $t = 0$ is given by the function $f(t) = 288t - 16t^2$. Find the velocity of the object when it hits the ground.
- Find the equation of the tangent line at $x = 2$ to $f(x) = x^4 - 3x^2$ (you may use your derivative rules here).