

Math 105 - Practice Exam #1

Show as much work as possible. Answers with no work shown on the EXAM will receive no credit.

1. Calculate the following limits. For full credit, show your work.

a. $\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3}$

b. $\lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4}$

c. $\lim_{x \rightarrow \infty} \frac{2x^3 - x - 3}{6x^2 - x - 1}$

d. $\lim_{x \rightarrow \infty} \frac{2x^3 - x - 3}{6x^3 - x - 1}$

e. $\lim_{x \rightarrow \infty} \frac{2x^2 - x - 3}{6x^3 - x - 1}$

2. Evaluate the following limits. Use proper limit notation.

a. $\lim_{x \rightarrow 0^+} \frac{1}{x}$

b. $\lim_{x \rightarrow 0^-} \frac{1}{x}$

c. $\lim_{x \rightarrow 0} \frac{1}{x}$

3. Use left and right hand limits and proper limit notation to evaluate the following limits.

a. $\lim_{x \rightarrow 5^-} \frac{-3x}{x-5}$

b. $\lim_{x \rightarrow 1^-} \frac{x - \sqrt{x}}{x - 1}$

4. A closed cylindrical can has surface area 120π square inches. Express the volume of the can as a function of its radius. Be sure to declare all variables. (Recall, volume of a cylinder $V = \pi r^2 h$)

5. Consider the function $f(x) = \frac{-3}{x+2}$.

- What's the domain of this function (use interval or set notation)?
- Does the function have a horizontal asymptote? If so, what's its equation?
- Does the function have a y-intercept? If so, find it.
- Is f continuous at $x = 2$? If so, show all parts of the definition of continuity hold. If not, show at least one fails.

- e. Is f continuous at $x = -2$? If so, show all parts of the definition of continuity hold. If not, show at least one fails.
- f. Calculate the derivative of f using **the definition of the derivative**. (For full credit, use the “long” method we learned in class)
- g. Write the equation of the tangent line to f at the point $(1, -1)$. Please give the equation in slope-intercept form.
- h. What’s the **average rate of change** of f between $x = 1$ and $x = 3$?

6. Use the **definition of the derivative** to compute the following derivatives. Simplify all answers completely.

a. $f(x) = 2 - 7x$

b. $f(x) = 5x^2$

c. $f(x) = 2x^2 + 4x - 1$

d. $f(x) = \frac{6}{x}$

e. $f(x) = \sqrt{x}$

7. Find the **equation of the tangent line** in slope intercept form that is tangent to $f(x) = x^2$ at $x = 3$.
(Hint: Use the definition of the derivative to compute the slope, then find the y value for the given x value. Now you have a slope and a point and can compute the equation of this tangent line.)

All material covered so far in the course is fair game for the exam. These problems are practice problems and you should study similar problems in the textbook in order to get the repetition needed to be prepared for Exam 1.