

Practice Midterm 1

MAT 131, Fall 2017

Name:	ID #:	Section:
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Please answer each question in the space provided. Show your work whenever possible. Unless otherwise marked, **answers without justification will get little or no partial credit**. Cross out anything the grader should ignore and circle or box the final answer.

No calculators!

(1) Calculate the following limits

(a) $\lim_{x \rightarrow 2} 3x^2 + x - 2$

(b) $\lim_{y \rightarrow -3} |y + 3|$

(c) $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$

(d) $\lim_{q \rightarrow 2} \frac{2q^2 + 5}{\sqrt{q+2}}$

(e) $\lim_{t \rightarrow 3} \frac{\sqrt{t} - \sqrt{3}}{t - 3}$

(f) $\lim_{s \rightarrow 0} s^2 \cos\left(s + \frac{1}{s}\right)$

(2) Calculate

$$\lim_{x \rightarrow (\pi/2)^-} \frac{1 + \tan x}{1 - \tan x}$$

(3) Let $f(x) = \left|1 + \frac{1}{x}\right|$.

(a) Sketch the graph of f and identify the asymptotes.

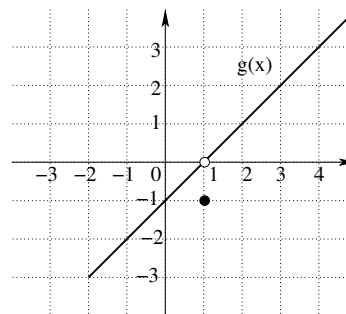
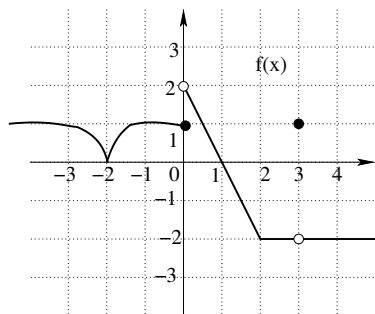
(b) Find all values of x for which f is not continuous.

(4) Find

$$\lim_{x \rightarrow 1} e^{(x^2 - x - 1)}.$$

Between which two integers (whole numbers) does the answer lie?

- (5) Use the graphs of $f(x)$ and $g(x)$ below to compute each of the following quantities. If the quantity is not defined, say so.



$$\begin{array}{cccc}
 f(0) & \lim_{x \rightarrow 0^+} f(x) & \lim_{x \rightarrow 0^-} f(x) & \lim_{x \rightarrow 0} f(x) \\
 \lim_{x \rightarrow 1} g(x) & \lim_{x \rightarrow 1} f(x) - g(x) & \lim_{x \rightarrow 3} (2f(x) - f(3)) &
 \end{array}$$

- (6) Consider the function

$$f(t) = \begin{cases} \frac{t}{t-1} & t \geq 0 \\ t+1 & t < 0 \end{cases}$$

- (a) At which points is this function continuous?
 (b) Find the left and right limits, if they exist, at $t = 0$.

- (7) Find an interval of length 1 which contains the root of the following function. Please remember to write the justification **why** this interval contains the root, not just the answer!

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

- (8) Suppose $f(x) = 3 + \frac{1}{2x+1}$
 (a) Compute $f'(1)$ using the definition of derivative (without using the power rule or other rules for computing derivatives - even if you know them!)
 (b) Write the equation of the tangent line to the graph of this function at $x = 1$.

- (9) Determine the points where the function $y = f(x)$ whose graph is given below is not differentiable

