

MATH 135 section 1 – Calculus 1
Practice Questions for Exam 2
October 11, 2013

1. Compute the indicated limits. Show all work for full credit.

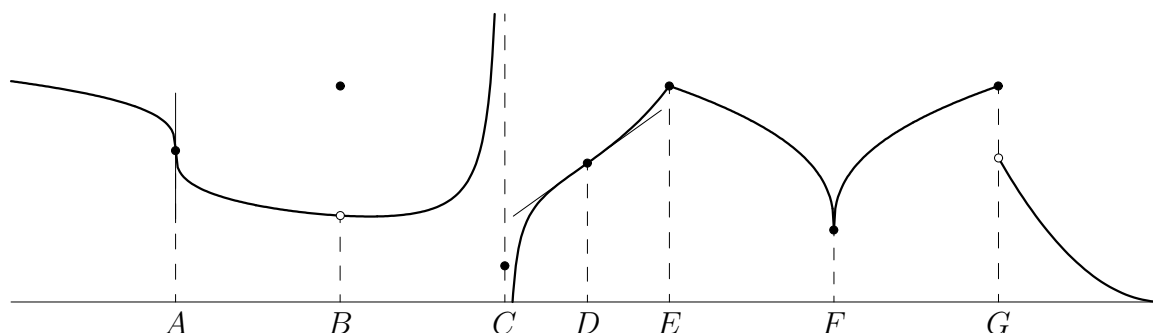
(a) $\lim_{x \rightarrow 1} \frac{3x^2 - 5x - 2}{x^2 - 4x + 4}$

(b) $\lim_{x \rightarrow 2} \frac{3x^2 - 5x - 2}{x^2 - 4x + 4}$

(c) $\lim_{x \rightarrow \infty} \frac{3x^2 - 5x - 2}{x^2 - 4x + 4}$

(d) $\lim_{x \rightarrow 2^+} \frac{|x - 2|}{x^2 - 5x + 6}$

2. The graph of a function f is shown below with several points marked. Find all the marked points at which the following are true, and give explanations for your answers.



- (a) f is discontinuous.
 (b) f is continuous, but the graph of f has a vertical tangent line.
 (c) f is continuous, but the graph of f has no tangent line.
3. Use the sum, product, and/or quotient rules to compute the following derivatives. You may use any correct method, but must show work and simplify your answers for full credit.

(a) $\frac{d}{dx} \left(5x\sqrt{x} - \frac{2}{x^3} + 11x - 4 \right)$

(b) $\frac{d}{dt} (t^2 e^t)$

(c) $\frac{d}{dz} \frac{z^2 - 2z + 4}{z^2 + 1}$

(d) $\frac{d}{dx} \left(\frac{\pi^2 + \tan(e^\pi) - 2x^e}{4} \right)$

4. Do not use the differentiation rules from Chapter 3 in this question.
- (a) State the limit definition of the derivative $f'(x)$.
 - (b) Use the definition to compute the derivative function of $f(x) = \frac{1}{3x}$.
 - (c) Find the equation of the line tangent to the graph $y = \frac{1}{3x}$ at $x = 2$.
5. The total cost (in \$) of repaying a car loan at interest rate of $r\%$ per year is $C = f(r)$.
- (a) What is the meaning of the statement $f(7) = 20000$?
 - (b) What is the meaning of the statement $f'(7) = 3000$? What are the units of $f'(7)$?
6. Let $f(x) = x^3 - x^2$.
- (a) Compute $f'(x)$ using the definition.
 - (b) Find all intervals on which $f'(x)$ is **negative**. What is true about f on those intervals?
 - (c) Find all intervals on which $f'(x)$ is **positive**. What is true about f on those intervals?