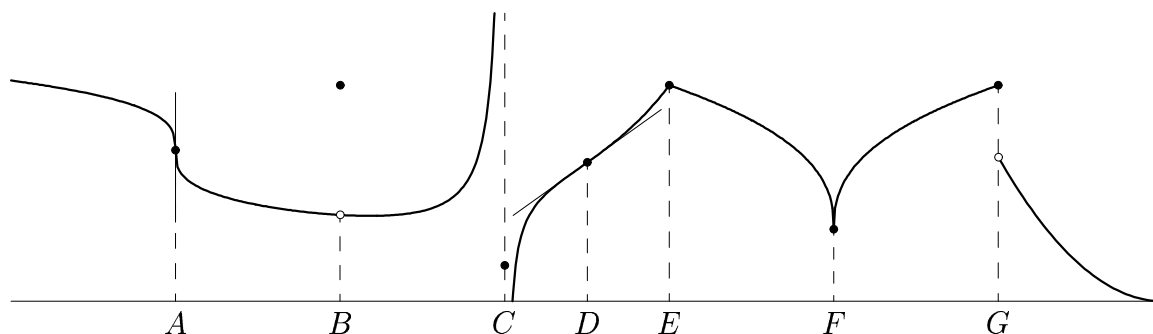


MATH 131, section 1 – Practice Questions for Exam 2  
October 17, 2007

1. All parts of this question refer to the parametric curve  $x = 3 \cos(2t)$ ,  $y = 5 \sin(2t)$ .
  - (a) Eliminate the parameter  $t$  and find a Cartesian equation for this curve.
  - (b) What portion of the curve is traced out for  $0 \leq t \leq \frac{\pi}{2}$ , and in which direction is the curve being traced?
  - (c) What would change in your answer to part b if the curve above was replaced by  $x = 3 \cos(-2t)$ ,  $y = 5 \sin(-2t)$ ?
  
2. 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)  $\frac{d}{dx} \left( \frac{\pi^2 + \tan(e^\pi) - 2x^e}{4} \right)$
  
3. 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.

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

5. Let  $f(x) = x^3 - x^2$ .

(a) Find all intervals on which  $f$  is **decreasing**.

(b) Find all intervals on which  $f$  is **concave up**.

(c) Find all intervals on which  $f$  is both **increasing** and **concave down**.

6. 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  $x = 2$ .

7. 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  $f'(7)$ ?