

College of the Holy Cross, Fall Semester, 2005
Math 131, Practice Midterm 2

1. Compute the following derivatives. You may use any correct method.

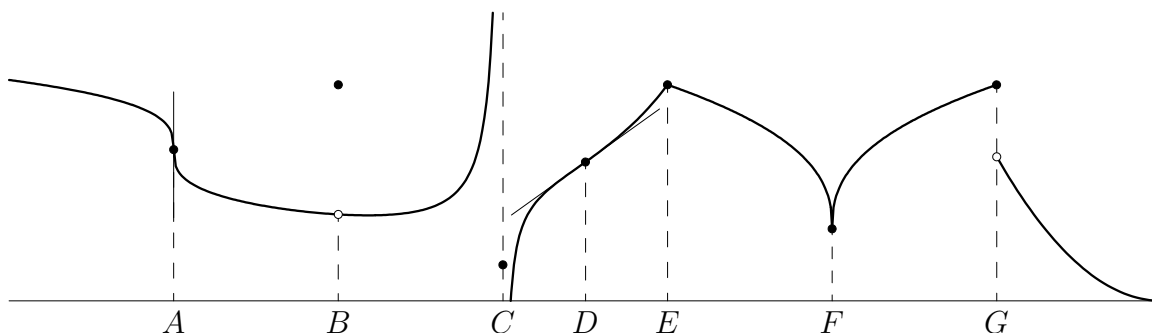
(a) $\frac{d}{dx} \left(5x\sqrt{x} - \frac{2}{x^3} + 11x - 4 \right)$

(b) $\frac{d}{dt} (t^2 e^{-5t})$

(c) $\frac{d}{dz} 8(z^2 + 4 \cos z + 2)^3$

(d) $\frac{d}{dx} \left(\frac{x}{\sin x} \right)$

2. The graph of a function f is shown below with several points marked. Check the appropriate boxes.



Point at which	A	B	C	D	E	F	G
f is not continuous	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f is not differentiable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

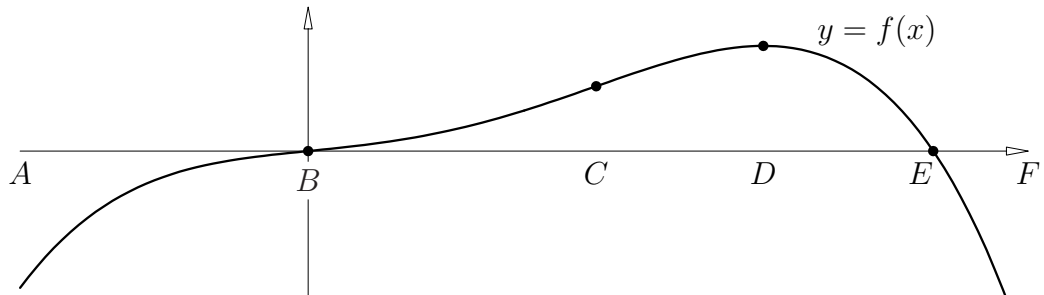
3. Compute the indicated limits. Show all work for full credit.

(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) $\lim_{x \rightarrow 1^-} 3 \cdot \frac{x - 1}{|x - 1|} + 1$

4. Each part refers to the graph shown.



- (a) Find all intervals on which $f(x) > 0$.
- (b) Find all intervals on which $f'(x) > 0$.
- (c) Find all intervals on which $f''(x) > 0$.
5. (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 tangent line to the graph of $f(x) = \frac{1}{3x}$ at $x = 2$.
6. The world's population is about $P(t) = 6e^{0.013t}$ billion people, with t measured in years since 1999. Find $P'(17)$. Write a sentence or two explaining the meaning of your answer; be sure to include a discussion of units.