

Math 2143 - Brief Calculus with Applications

Exam #1 - 2014.09.23

Name: _____

1. (10 pts.) Sketch the graph of a function $f(x)$ which satisfies the following properties:

(a) Domain is $[-1, 3) \cup (3, 6)$

(b) $\lim_{x \rightarrow 3^-} f(x) = +\infty$

(c) $\lim_{x \rightarrow 3^+} f(x) = -\infty$

(d) $f(0) = 2$

(e) $\lim_{x \rightarrow 0} f(x) = 0$

(f) $f(x)$ is continuous everywhere on its domain except at $x = 0$

2. (10 pts. each) Compute the following limits:

(a) $\lim_{x \rightarrow 1} \frac{2x^2 - x - 1}{x - 1}$

(b) $\lim_{h \rightarrow 0} \frac{\frac{1}{2h+3} - \frac{1}{3}}{h}$

$$(c) \quad \lim_{h \rightarrow 0} \frac{\sqrt{2h+1} - 1}{h}$$

$$(d) \quad \lim_{x \rightarrow 2^-} \frac{(x+2)(x+1)}{(x-3)(x-2)}$$

3. (10 pts. each) Compute the following derivatives (do not simplify your answer):

(a) $\frac{d}{dx} \frac{x^2 - 4x + 3}{x^2 + 2x - 1}$

(b) $\frac{d}{dx} \sqrt{\frac{5x + 1}{2x + 6}}$

(c) $\frac{d^3}{dx^3} \left(x^2 - \frac{3}{x} + \frac{2}{x^2} \right)$

4. (10 pts.) Find the equation of the tangent line to $f(x) = x^2 - 3x + \frac{4}{x} - 2$ at $x = 1$.