Exam 1

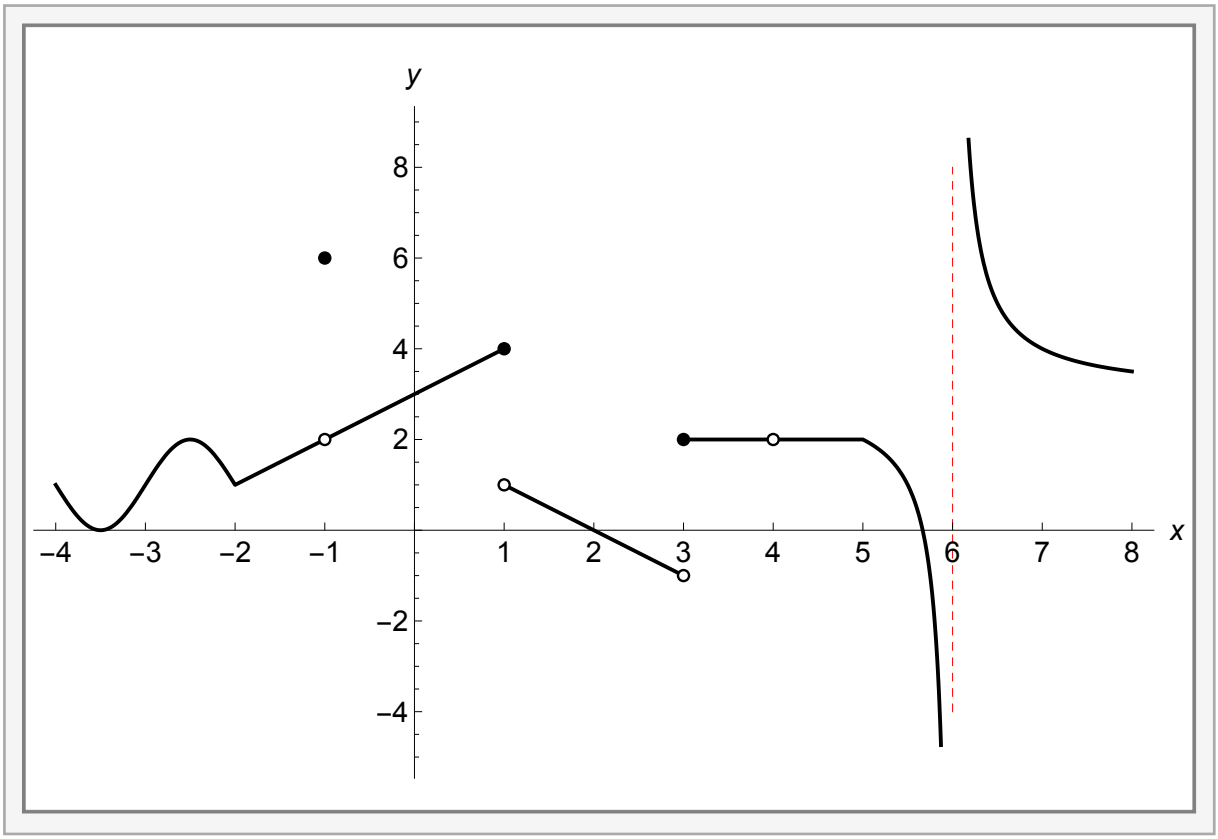
Name: Date: June 4, 2015

P 1. [2 Points] State the limit definition of the derivative.

P 2. [2 Points] State the Intermediate Value Theorem.

P 3. [2 Points] State the Squeeze Theorem.

P 4. [7 Points] Consider the graph of f below.



Use the graph of f to answer the following.

(a) $\lim_{x\to -1^+} f(x)$

(b) $\lim_{x\to 1^+} f(x)$

(c) $\lim_{x\to 3^+} f(x)$

(d) $\lim_{x\to 3^-} f(x)$

(e) $\lim_{x\to 3} f(x)$

(f) $\lim_{x\to 4} f(x)$

(g) $f(4)$

(h) $f(-1)$

(i) $\lim_{x\to 6^+} f(x)$

(j) $f'(-2)$

(k) $f'(-2.5)$

(l) $f'(1.5)$

(m) $f'(4.5)$

(n) $f'(-1)$

P 5 (10 Points)**.** Find the indicated limit. If it does not exist, state so and explain why.

$$\lim_{x \to 25} \frac{x - 25}{\sqrt{x} - 5}$$

P 6 (10 Points)**.** Let

$$f(x) = \begin{cases} -e^x + 1, & \text{if } x < 0 \\ 5, & \text{if } x = 0 \\ \cot(x), & x > 0 \end{cases}$$

Evaluate

1. $\lim_{x \to 0^-} f(x)$

2. $\lim_{x \to 0^+} f(x)$

3. $\lim_{x \to 0} f(x)$

P 7 (5 Points)**.** Let

$$f(x) = \begin{cases} x+5, & x < -1 \\ B, & x = -1 \\ (x+3)^2, & x > -1 \end{cases}$$

Find a value for B such that $f(x)$ is continuous at $x = -1$.

P 8 (10 Points)**.** Find the derivative of $f(x) = \frac{1}{x}$ using the limit definition of the derivative.

P 9 (8 Points)**.** Find the derivative of

$$f(x) = e^{2x} \sin 3x + 3 \ln(x^2 - 1)$$

Show all steps!

P 10 (10 Points)**.** Find an equation of the tangent line to the graph of

$$y = \frac{2x}{\ln x} + x$$

at the point $(e, 3e)$.

P 11 (10 Points)**.** Find an equation of the tangent line to the graph of

$$y = 2\sin x \cos x + \tan x$$

at the point $(\pi/4, 2)$.

P 12 (4 Points)**.** Find the fourth derivative of

$$f(x) = \frac{1}{2x - 1}$$

P 13 (10 points)**.** Find the derivative

$$y^2 + x^2 y = 30 \sin x$$

P 14 (10 points)**.** Find an equation for the tangent line to the graph of

$$xy^3 - \ln y = e^x$$

at the point $(0, e^{-1})$.