Lecture time: 1 pm

Midterm Exam 1

Math 0220

Spring 2015

Name: _____

No calculators, no books. Show all your work (no work = no credit). Write neatly. Simplify your answers when possible.

---

1. Find the limit, if it exists. If the limit does not exist explain why. You may use any method except the L'Hospital's Rule.

   (a) (8 points) $\lim_{x \to -2} \dfrac{\sqrt{x+3} - 1}{x+2}$

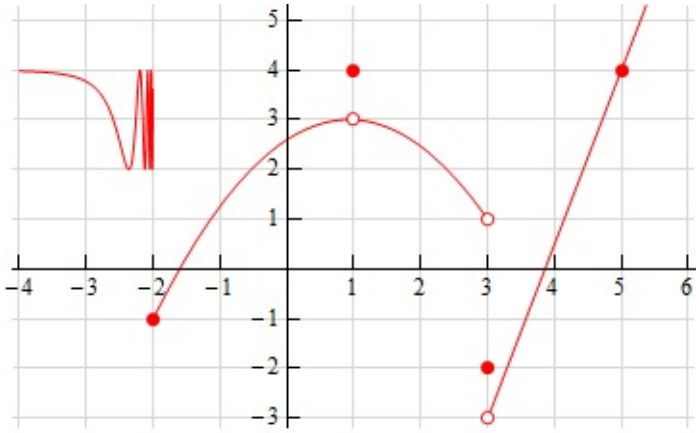
   (b) (8 points) $\lim_{x \to -1} \dfrac{x+1}{|x+1|}$

   (c) (8 points) $L = \lim_{h \to 0} \dfrac{f(5+h) - f(5)}{h}$, where $f(x) = x^3$.

   (d) (8 points) $\lim_{x \to 0^-} \dfrac{\cos(3x)}{5x}$

2. (5 points) Determine the equation of the line which that passes through the points $(12, 6)$ and $(8, -2)$. Write it in the Slope-Intercept form.

3. For the function $f(x)$ graphed below find the following values. If they do not exist state the reason.



(a) (1 point) $\lim_{x \to 1} f(x)$

(b) (1 point) $f(1)$

(c) (1 point) $\lim_{x \to 3} f(x)$

(d) (1 point) $f(3)$

(e) (2 points) $\lim_{x \to -2^-} f(x)$

(f) (2 points) $\lim_{x \to -2^+} f(x)$

4. (10 points) Explain why the function

$$f(x) = \begin{cases} \dfrac{x-3}{|x-3|} & \text{if } x \neq 3 \\ 1 & \text{if } x = 3 \end{cases}$$

is discontinuous at $x = 3$. Is the discontinuity removable? State the reason why.

5. The position of a particle is given by the function $s(t) = t^2 - t + 2$

(a) (5 points) Determine the average velocity on the interval $[3, 3 + h]$. Simplify your answer.

(b) (5 points) Determine the instanteneous velocity at time $t = 3$.

6. Find the derivatives the following functions. Mention rules used. You do not need to simplify your answer.

(a) (6 points) $f(x) = \sin^3(2x) + x\sqrt{x}$

(b) (6 points) $f(x) = \dfrac{5x^4 - x^2}{\tan(2x)}$

(c) (6 points) $f(x) = \sqrt{\dfrac{x^2 - 3x + 4}{2x + 6}}$

7. (7 points) Calculate $y'(0)$ if $x\cos(x+y) = (xy)^3 + y$ where $y = y(x)$.

8. (10 points) A car runs along an elliptic track which has the path

$$2x^2 + 5y^2 = 38$$

measured in miles. As it reaches the point $(3, 2)$, the x-coordinate of its path is changing at the rate of 100 miles per hour. At what rate is the y-coordinate changing?

bonus problem (10 points extra) Find the limit $\lim_{x \to 0} \dfrac{\cos(\pi + x) + 1}{x}$ if it exists.

If it does not exist explain why. Show all work. No L'Hospital's Rule is allowed.