

Final: MATH 220 - Calculus 1

July 28th 2017

Name:

Instructor:

1	2	3	4	5	6	7	8	9	10	Total

Instructions: You have 1 hour and 15 minutes to complete this exam.
Show all of your work. Calculators are not allowed.

1) (20 points) Find the area of the region enclosed by $y = x^2 + 4$, $y = x$, $x = -1$ and $x = 2$.

2) (5 points each) Compute the following:

a) $\frac{d}{dx}(\int_{-1}^{e^{3x}} (\ln(t) + t) dt)$

b) $\int (-x^3 + 2x^{-3}) dx$

c) $\int x \cos(x^2 + 1) dx$

d) $\int_0^1 (3x^2 + 2x)(x^3 + x^2)^3 dx$

3) (20 points) Find the volume of the solid with base bounded by $y = x^2 + 2$ and $y = 6$, where the cross-sections perpendicular to the y-axis are rectangles of height 3.

4) (15 points) Calculate the instantaneous rate of change for $f(x) = \frac{1}{x^2}$ at $a = -2$ using the limit definition.

5) (15 points) Find and classify the critical values of the function $f(x) = \frac{x^2}{3x-6}$.

6) (5 points each) Compute the following:

a) $\frac{d}{dx}((x^3 + 4)e^{\sin(x)})$

b) Find $\frac{d^2y}{dx^2}$ for $y = e^{-x} + \ln(x)$.

c) Find $\frac{dy}{dx}$ for $y^3 = \cos(y) + x^2$.

d) $\frac{d}{dz}((z - 3z^{-1})^2)$

7) (4 points each) Evaluate the following limits:

a) $\lim_{x \rightarrow 0} \frac{x \sin(x)}{\cos(x) - 1}$

b) $\lim_{x \rightarrow -3} \frac{\ln(x+5)}{x+1}$

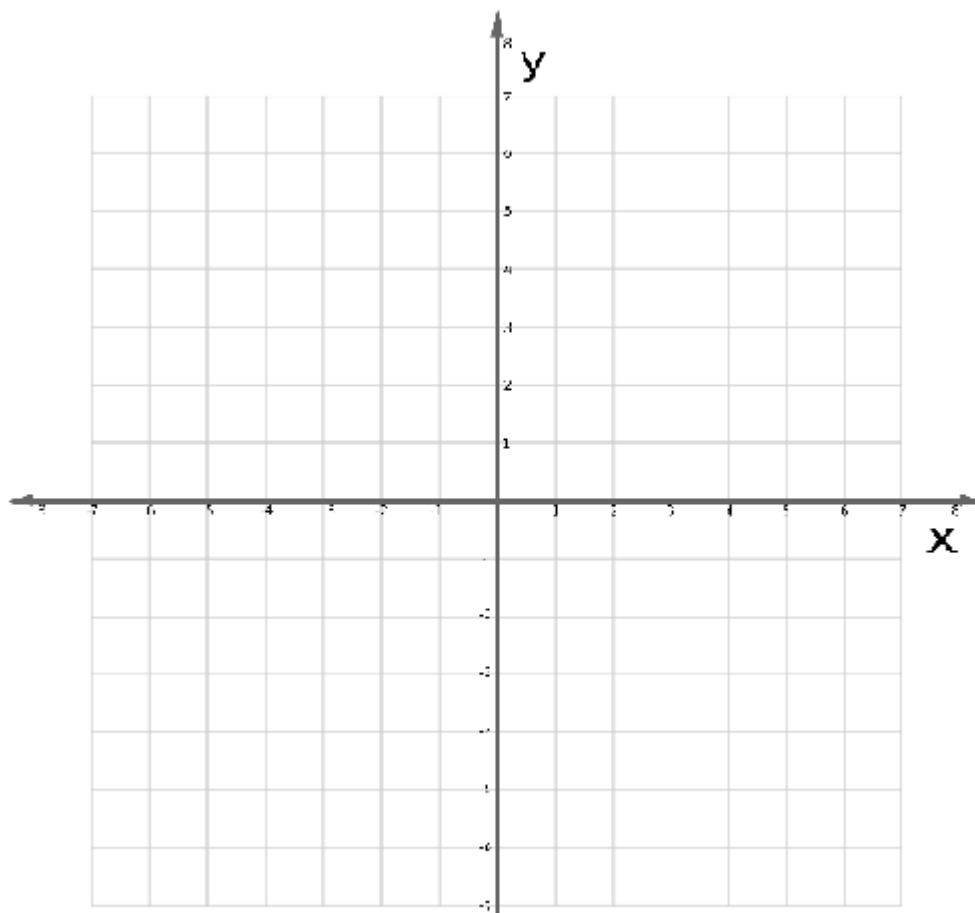
8) (10 points) State The Fundamental Theorem of Calculus Pt I, Pt II, or the Intermediate Value Theorem.

9) (12 points) Sketch the graph of a function $y = f(x)$ satisfying all of the following criteria:

(i) Jump discontinuity at $x = -3$ such that $f(x)$ is left-continuous at $x = -3$.

(ii) $\lim_{x \rightarrow 5} f(x) = -4$ and $f(5) = 0$.

(iii) $\lim_{x \rightarrow 1^+} f(x) = +\infty$ and $\lim_{x \rightarrow 1^-} f(x) = -\infty$



10) (10 points) Identify the graphs of $f(x)$, $f'(x)$, and $f''(x)$:

