Math 201 Test 1 Review 1

October 23, 2019

Name:		

Note that both sides of each page may have printed material.

Instructions:

- 1. Read the instructions.
- 2. Panic!!! Kidding, don't panic! I repeat, do NOT panic! Don't look down, while you're at it.
- 3. Complete all problems in the actual test. Bonus problems are, of course, optional. And they will only be counted if all other problems are attempted.
- 4. You have 1 hour to complete the test.
- 5. Show ALL your work to receive full credit. You will get 0 credit for simply writing down the answers.
- 6. Write neatly so that I am able to follow your sequence of steps and box your answers.
- 7. Read through the exam and complete the problems that are easy (for you) first!
- 8. Scientific calculators are allowed, but you are NOT allowed to use notes, graphing calculators, or other aids—including, but not limited to, divine intervention/inspiration, the internet, telepathy, knowledge osmosis, the smart kid that may be sitting beside you or that friend you might be thinking of texting.
- 9. In fact, cell phones should be out of sight!
- 10. Use the correct notation and write what you mean! x^2 and x^2 are not the same thing, for example, and I will grade accordingly.
- 11. Other than that, have fun and good luck!

May the force be with you. But you can't ask it to help you with your test.

1.	(a) (15 points) Let $f(x) = 2x - \frac{3}{x}$. Use the limit definition of the derivative to find $f'(x)$. No credit will
	be given for any other method!

(b) (5 points) Using your answer to part (a), compute the equation of the tangent line to f(x) at the point where x=1. Write your line in y=mx+b form.

- 2. (a) (5 points) Using an equation, define what it means for a function f(x) to be continuous at a point (a, f(a)).
 - (b) (10 points) Consider the function

$$f(x) = \begin{cases} a - x & , x \le -2\\ \frac{x^2 + 4x + b}{x + 2} & , x > -2 \end{cases}$$

Find the values of a and b that will make the function continuous everywhere.

(c) (5 points) Using interval notation, state where the following function is continuous. Justify your claim!

$$g(x) = \frac{2x^2}{\sqrt{3-x} - \sqrt{2+x}}$$

3. (a) (3 points each) Compute the following limits, **you need not show your work for part (a)**, just state the answer. Note that ∞ , $-\infty$, and DNE are valid answers.

(i)
$$\lim_{x \to -\infty} \frac{\pi^2 + 3x^2 - 3\pi x^3}{4x^3 + 3\pi x + 2} = \underline{\qquad} \qquad \text{(ii)} \lim_{x \to -\infty} \frac{(2x+4)^3(2-3x^2)}{(3-x^2)(2x+1)^2} = \underline{\qquad}$$

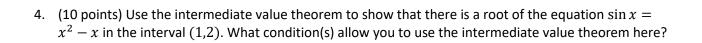
(iii)
$$\lim_{x \to \infty} \frac{7 - \frac{2}{x} + \frac{3\pi}{x^2} + \frac{2x^7}{5}}{2\pi x^{10} + 6x^3 - \pi x^9} = \underline{\qquad} \text{(iv) } \lim_{x \to -\infty} \frac{x^3 \cos x^2}{4 - x^3} = \underline{\qquad}$$

(b) (6 points each) Compute the following limits. Show your work in this part. Note that ∞ , $-\infty$, and DNE are valid answers.

(i)
$$\lim_{x \to 1} (x^2 - 2x + 1) \cos^2 \frac{1}{(x-1)^2}$$

(ii)
$$\lim_{x \to -1} \frac{|x^2 - 4x|}{x^2 - 3x - 4}$$

(iii)
$$\lim_{x\to 0} \frac{\sin 4x + 6x}{\tan 5x}$$



5. (4 points each) Compute
$$y' = \frac{dy}{dx}$$
 for the following:

(a)
$$y = 2\sqrt{x} + \frac{5}{\sqrt[3]{x}} - \pi^2$$

$$(b) y = \log_3(x+2)$$

(c)
$$y = (x - \sin x)^{\sqrt{5}}$$

(d)
$$y = e^{x^2} \ln x$$

(d)
$$\tan x = 8\sin y - 3xy$$

1. Use the definition of the derivative to find the derivative of $c(x) = \cos x$

2. Compute the derivative:

(a)
$$y = x^2 + x^x$$

(b)
$$y = \frac{e^x \sqrt{x+1}}{x^2 \sin x}$$

3. On what interval(s) is the function $f(x) = \frac{x}{x^2 - 1}$ is concave up? Concave down? Find the x-value of its inflection point, if it has one. State that it doesn't have one if that's the case.

4. A 15 foot ladder rests against a vertical wall. Suddenly, and without warning, Batman starts pushing the foot of the ladder towards the wall at a rate of 2 meters per second. How fast is the top of the ladder sliding up the wall when the foot of the ladder is 9 feet from the wall?