MATH 1680-123 (Business Calculus) Test 3

March 22, 2021 **Name:** _____

Read all of the following information before starting the exam:

- Show all work, clearly and in order, if you want to get full credit. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Justify your answers algebraically whenever possible.
- Enter your final answers in blanks provided.
- This exam has 7 problems and is worth 100 points. It is your responsibility to make sure that you have all of the pages!
- Only TI-30Xa calculator can be used during the Test.
- Good luck!

Differentiate the following functions with respect to x. DO NOT SIMPLIFY.

1) [6 points] $y = \dfrac{4x^3 + x^2}{e^{3x^4}}$

$y' =$ _____

2) [4 points] $y = \ln\left(3x^5 + 2x^3\right) + 5$

$y' =$ _____

3) [7 points] $y = \left(3x^2 - 5\right)\ln\left(3x^4\right)$

$y' =$ _____

4) [8 points] $y = (2x)^{x^3}$

$y' =$ _____

5) [7 points] $y = e^{x^3+2x} + \left(\ln 2x^3\right)^3$ $y' =$ _____

6) [8 points] James, the manager of a vineyard, estimates that the first 5,000 bottles of wine produced this season will fetch a profit of \$5/bottle. But if more than 5,000 bottles are produced, then the profit per bottle for the entire lot will drop by \$0.0001 for each additional bottle sold. Assuming that at least 5,000 bottles of wine are produced and sold, what is the maximum profit?

Max. Profit = _____

Find the limit if it exists. If limit does not exist, write DNE.

7) [8 points] $\lim_{x\to 0} \dfrac{2x^2}{3e^x - 3 - 3x} =$ _____

8) [8 points] $\lim_{x\to \infty} \dfrac{\ln x^2}{x - 1} =$ _____

9) [8 points] $\lim_{x\to 2} \dfrac{e^x + 1}{8 - 2x^2} =$ _____

Evaluate the following indefinite integrals. Do not leave negative or fractional exponents. Simplify

10) [10 points] $\int \frac{2x^3}{5} + 6e^x - \frac{2}{x}\, dx \; =$ _____

11) [10 points] $\int 3\sqrt{x} + \frac{4}{5x^2} + \frac{3}{4x}\, dx \; =$ _____

12) [8 points] Find the present value of $10,000 due in 2years at an interest rate of 4% compounded daily. (Assume a 365-day year. Round your answer to the nearest cent.)

13) [8 points] How long will it take an investment of $15,000 to double if the investment earns interest at the rate of 8%/year compounded continuously? (Round your answer to one decimal place.)