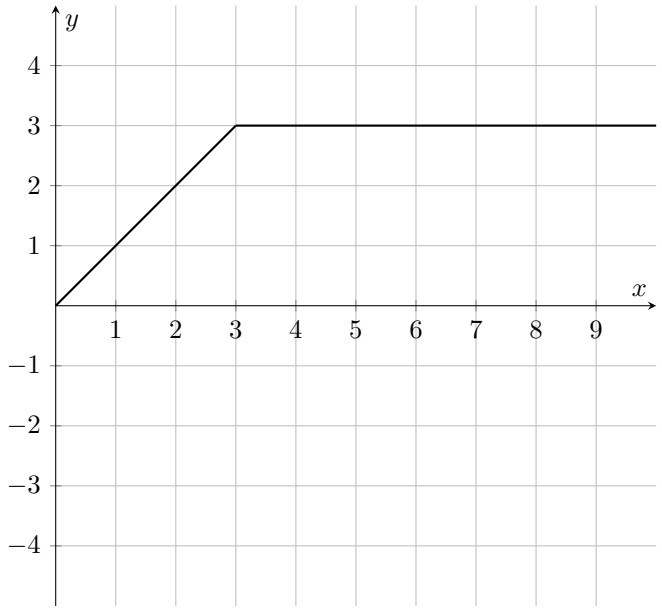
Name:_____ Instructor:_____

Signature:_____ Wildcat ID:_____

Math 220
Final Exam
August 2, 2019

No books, calculators, or notes are allowed. Please make sure your cell phone is turned off. You will have 75 minutes to complete the exam.

Problem	Points	Points Possible
1		12
2		20
3		20
4		15
5		15
6		15
7		8
8		10
9		15
10		20
11		10 (EC)
Total Score		150



1. (4 points each) Consider the graph of $y = f(x)$ above. State the value of each of the quantities below. You do not need to show any work.

(a) $\int_0^3 f(x)dx =$

(b) $\int_3^6 f(x)dx =$

(c) $\int_0^6 f(x)dx =$

2. (10 points each) Evaluate each of the following indefinite integrals.

(a) $\int te^{t^2} dt$

(b) $\int x\sqrt{4+x}dx$

3. (10 points each) Evaluate each of the following definite integrals.

(a) $\displaystyle\int_0^{\pi/4} \sec^2(\theta)d\theta$

(b) $\displaystyle\int_1^e \frac{\ln(x)}{x}dx$

4. (15 points) Find the area between the graphs of $f(x) = x^3 - 2x$ and $g(x) = x^2$. Simplify your final answer until you have a single fraction (or whole number).

5. (15 points) Compute the volume of the solid whose base is the unit circle and whose vertical cross sections perpendicular to the x-axis are squares.

6. (15 points) Compute the volume of the solid obtained by rotating the region enclosed by $y = x^2$, $x = 1$, and the x-axis around the x-axis.

7. Compute $\dfrac{dy}{dx}$ for each of the following. You do not need to simplify your answers.

(a) (1 point) $y = \ln(4)$

(b) (7 points) $y = e^{\cos(x^2)}$

8. (10 points) Find the equation of the tangent line to the graph of $f(x) = \sin(2x)$ at $x = \pi/4$.

9. (a) (5 points) Find all critical points of the function $f(x) = \frac{1}{4}x^4 - \frac{9}{2}x^2 + 2$.

(b) (10 points) Use either the First Derivative Test or the Second Derivative Test (you may choose which one) to classify each critical point of $f(x)$ as a local maximum, local minimum, or neither. Show all of your work **clearly**.

10. (20 points) An oil tanker ruptures and spills oil in a circle whose area increases at a rate of 2π m^2/s. How fast is the radius increasing when the area is 16π m^2? Include units in your final answer.

11. (Extra Credit) No partial credit will be awarded. However, you may earn full credit on either (a) or (b) without the other.

(a) (5 points) Show that $\displaystyle\int_0^{\pi/2} \sin^2(x)dx = \int_0^{\pi/2} \cos^2(x)dx$. (*Hint:* What can you do to the graph of $\sin(x)$ to turn it into the graph of $\cos(x)$?)

(b) (5 points) Using the result from part (a) (or using a different method, if you can find one), evaluate $\displaystyle\int_0^{\pi/2} \sin^2(x)dx$.