Final Exam – December 9, 2014 **Fall 2014**
Math 150

Problem	Possible	Earned
1	18	
2	10	
3	40	
4	10	
5	10	
6	10	
7	20	
8	10	
9	11	
10	27	
11	18	
12	16	
Total	200	

Name: ______________________________

Instructor: ___________________________

Section: ____________________________

Please check to make sure that your copy of the examination has one cover sheet and all ten (10) pages with problems numbered 1 through 12.

Work in a neat and well-organized manner. Show your work on all problems. Full credit will not be given unless your work is clearly shown.

Only an approved (TI-30) scientific calculator will be permitted on the final examination for this course; however, calculators or computers with graphic, word-processing, symbolic manipulation or programming capabilities will not be allowed for this exam. The use of books, notes or other resource materials will not be permitted on the final examination.

All cell phones and electronic devices are PROHIBITED during the final exam.

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[18] 1. Find the following limits. Show your work.

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

b) $\lim_{\theta \to 0} \dfrac{\tan^2 3\theta}{\theta^2}$

c) $\lim_{x \to \infty} \dfrac{4x - 3x^2}{7x^2 - 8}$

[10] 2. Use the definition of the derivative to find $f'(x)$ if $f(x) = \dfrac{1}{x^2}$.

[40] 3. Find the derivative of each function. Do not simplify your answers.

a) $f(x) = x^3 e^{x^2}$

b) $g(x) = x^4 + 4^x + 4^4$

c) $p(x) = (2x-1)^5(x^2+4)^3$

d) $F(x) = \displaystyle\int_0^{x^2} \sin t^3 \, dt$

e) $q(x) = \dfrac{2\sin x}{3+\cos x}$

[10] 4. Use implicit differentiation to find dy/dx if $\tan(x+y) = x^2y^3 + 3y$.

[10] 5. Find an equation of the line tangent to the curve $y = 2\ln x + 1$ at $x = e$.

[10] 6. A balloon rises straight upwards at the rate of 15 ft per second. An observer is measuring the angle of elevation of the balloon from a point on the ground that is 100 ft from the point where the balloon lifted off. How fast is the angle of elevation of the balloon increasing when it is 200 ft above the ground? (Use radian measure for the angle of elevation.)

[20] 7. Let $f(x) = \dfrac{6x-18}{(x-2)^2}$. Then $f'(x) = \dfrac{-6x+24}{(x-2)^3}$ and $f''(x) = \dfrac{12x-60}{(x-2)^4}$.

a) Find the open intervals on which $f(x)$ is increasing and those on which $f(x)$ is decreasing.

b) Find the points on the graph of the function (x and y values) where $f(x)$ has local maxima and minima.

c) Find the open intervals on which the graph of $y = f(x)$ is concave up and those on which it is concave down.

d) Find all inflection points (x and y values) on the graph of $y = f(x)$.

[10] 8. Find the absolute maximum and absolute minimum values of the function $f(x) = x^3 - 2x^2 + x$ on the interval $[-1, 1]$.

[11] 9. Find the area of the largest rectangle that can fit under the parabola $y = 9 - x^2$ and above the x-axis.

[27] 10. Evaluate the following indefinite integrals:

a) $$\int \frac{x^3 - 5x + 3}{\sqrt{x}}\, dx$$

b) $$\int \frac{x^2}{x^3 + 8}\, dx$$

c) $$\int \left(2 \sin 3x + e^{-x}\right)\, dx$$

[18] 11. Evaluate the following definite integrals:

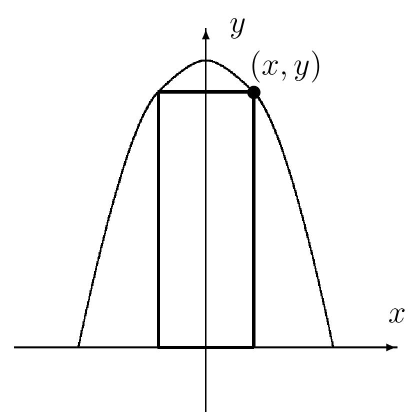
a) $\displaystyle\int_0^8 \frac{x}{\sqrt{x+1}}\,dx$

b) $\displaystyle\int_{-\pi}^{\pi} xe^{-3x^2}\,dx$

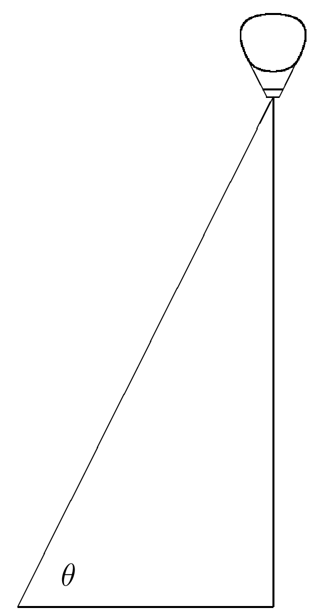
[16] 12. Let R be the region bounded by $y = 2x$ and $y = 6x - x^2$.

a) Find the area of the region R.

b) Set up, but do not evaluate, an integral that represents the volume of the solid generated by revolving the region R about the y-axis.



y
(x, y)
x



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