Name: _____ Section: (10AM/11AM/12:30PM)

MAT-175: Multivariable Calculus
Review Worksheet, Spring 2017

This worksheet is for practice only. Next week I will collect a homework set (from the text) similar to these exercises. CALCULATORS should NOT be necessary for most exercises — avoid using one. You should be very familiar/comfortable with most of these topics (#10 may be the exception, but study it anyway). If you struggle with these review topics, you MUST re-learn Calculus 1 topics to prepare for multivariable calculus.

1. (10 points) Evaluate the following limits. If the limit is infinite, answer using infinity. If the limit does not exist in some other way, write "DNE".

   (a) $\lim_{t\to 5} \dfrac{25-t^2}{t-5}$

   (b) $\lim_{x\to 4-} \dfrac{x-4}{|x-4|}$

   (c) $\lim_{x\to 4-} \dfrac{5}{x-4}$

2. (10 points) Find the derivatives of the given functions with respect to the variable x. Do not simplify.

(a) $y = 10^{100} - \sqrt{x} + 5x^{-3}$

(b) $g(x) = \sin(x)e^x$

(c) $t(x) = \sec(x)$

(d) $y = \frac{x}{\ln(x)}$

(e) $T(x) = \cos(x^6 - 87x)$

3. (10 points) Find dy/dx where $y^4 + x^2y = x^5$ using implicit differentiation.

4. (10 points) (a) What are all of the *local* maximum and minimum values of $g(x) = x^{2/3}(x-4)$ on the interval $[-8, 8]$ and at what values of x do they occur?

(b) Find the *absolute* maximum and minimum values of $g(x) = x^{2/3}(x-4)$ on the interval $[-8, 8]$ and state the values of x where they occur.

5. (10 points) I need to make a baking tray out of an 10 in $\times$12 in sheet of aluminum foil. I cut squares of side length x out of each corner and fold the resulting piece of aluminum foil into a rectangular baking tray. Find the dimensions of the tray that has the largest volume. Also find the volume. Draw a picture, label it appropriately, and solve the problem. Be sure to state your final answer in words with proper units. You may want use a calculator on this one.

6. (10 points) Find the following antiderivatives and definite integrals. Do not simplify.

(a) $\int (5x^4 - \sec^2(x) + 1/x)\, dx$

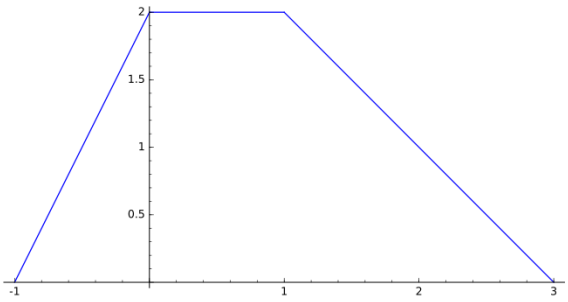
(b) $\int x \sin(x)\, dx$

(c) $\int_2^5 \dfrac{2x+3}{x^2+3x-4}\, dx$

(d) $\int \dfrac{x-11}{x^2+3x-4}\, dx$

7. Calculate the average value of the function $f(x) = \cos(2x)\, e^{1+\sin(2x)}$ on the interval $[-\pi, \pi]$.

8. (10 points) Evaluate $\int_{-1}^{3} f(x)\,dx$ where the graph of $y = f(x)$ is given below.

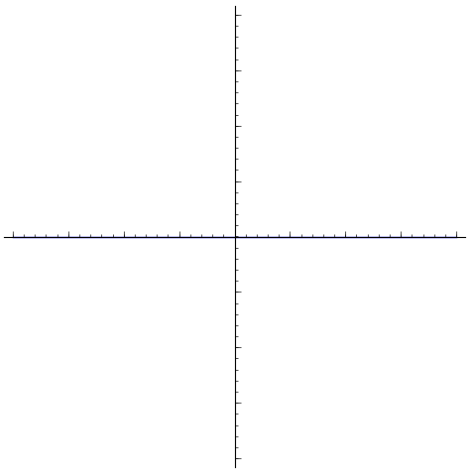
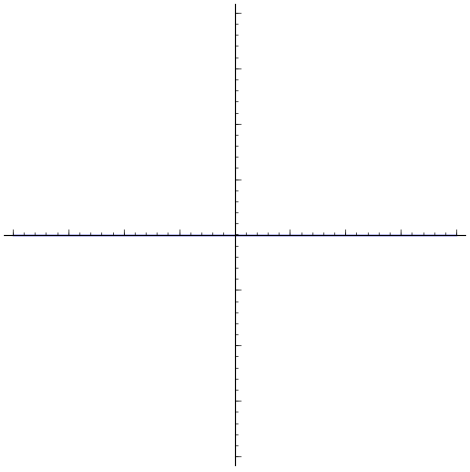
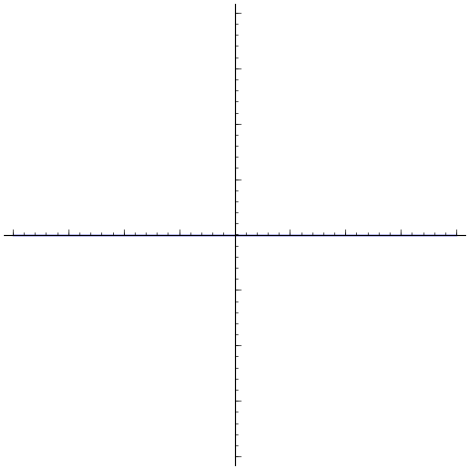


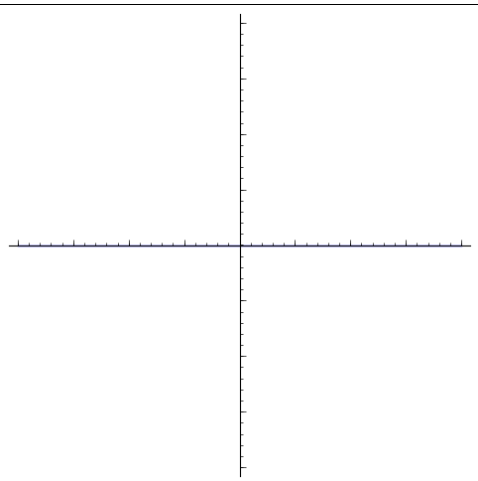
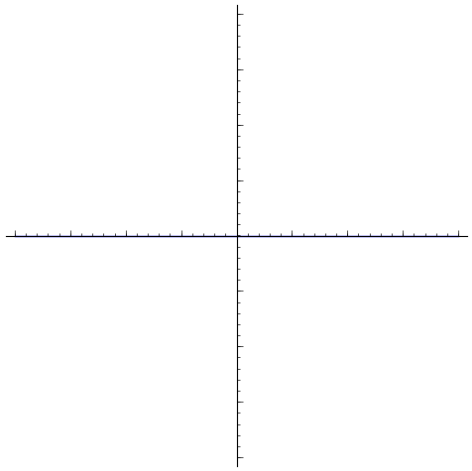
9. (10 points) Evaluate the integrals. Show all work for full credit.

   (a) $\int \cos^2(x)\,dx$

   (b) $\int \sin^2(x)\cos^2(x)\,dx$

10. (10 points) Review of Conic Sections: You will need to be comfortable with the graphs of the following equations – you'll see lots of them towards the end of chapter 11. If you do not remember them, look them up and memorize them! I recommend the following web page for review:
`https://www.khanacademy.org/math/algebra/conic-sections`

General Equation	Specific Example	Graph of Specific Example AND Name of Object
$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	$\frac{x^2}{4} + \frac{y^2}{9} = 1$	
$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	$\frac{x^2}{9} - y^2 = 1$	
$\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$	$\frac{y^2}{4} - \frac{x^2}{9} = 1$	

$x^2 + y^2 = r^2$	$x^2 + y^2 = 9$	
$x^2 = 4ay$	$x^2 = 4y$	
$y^2 = 4ax$	$y^2 = 4x$