Math 125, Sections D and E, Midterm I

January 28, 2016

Name_____

TA/Section_____

Instructions.

- There are 4 questions. The exam is out of 40 points.

- You are allowed to use one page of notes written only on one side of the sheet in your own handwriting. Hand in you note sheet with your exam.

- You can use a Ti-30x IIS calculator. Put away all other electronic devices.

- For your integrals you may use the following formulas. Anything else must be justified by your work.

$$\int x^n \; dx = \frac{x^{n+1}}{n+1} + C, n \neq -1 \qquad \int e^x \; dx = e^x + C \qquad \int \frac{1}{x} \; dx = \ln|x| + C$$

$$\int \sin x \; dx = -\cos x + C \qquad \int \cos x \; dx = \sin x + C \qquad \int \sec^2 x \; dx = \tan x + C$$

$$\int \csc x \cot x \; dx = -\csc x + C \qquad \int \sec x \tan x \; dx = \sec x + C = \qquad \int \csc^2 x \; dx = -\cot x + C$$

$$\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1} x + C \qquad \int \frac{1}{1+x^2} dx = \tan^{-1} x + C$$

- **Show your work**. If I cannot read or follow your work, I cannot grade it. You may not get full credit for a right answer if your answer is not justified by your work. If you continue at the back of a page, make a note for me.

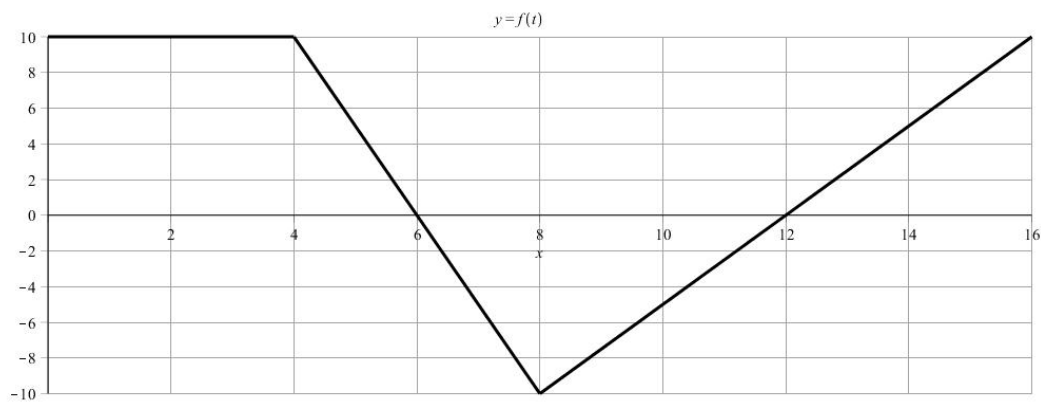| Question	points
1	
2	
3	
4	
Total	

1. Evaluate the following integrals.

(a) (3 points) $\int \dfrac{x+3}{\sqrt{x+2}}dx$

(b) (3 points) $\int_0^1 x(5x^2+1)^2 dx$

(c) (3 points) $\int_0^5 |x-3|\, dx$

2. Define $g(x) = \int_{2}^{x^2} f(t)\,dt$ where the graph of $f(t)$ is given below.

$y = f(t)$

(a) (2 points) Compute $g(2)$.

(b) (2 points) Express $g(4) - g(1)$ as a definite integral and compute its value.

(c) (4 points) Compute $g'(3)$.

(d) (2 points) Compute $g''(1)$.

3

3. (10 points) Find the area of the region to the left of the parabola $x = -(y-1)(y-4)$ and below the line $x = y - 1$. Include a picture of the region.

4. The region $\mathbf{R}$ is bounded by the hyperbola $y = \dfrac{1}{1+x}$, the vertical line $x = 3$ and the horizontal line $y = 2$.

   (a) (3 points) Show the region on the graph below and label all intersection points. The hyperbola is given to get you started.
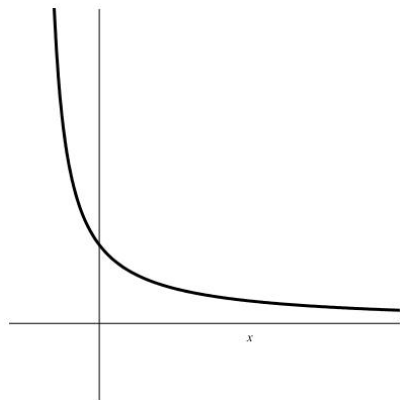
   (b) (3 points) Set up an integral to calculate the volume of the solid formed by rotating $\mathbf{R}$ about the x-axis. Do NOT integrate.

   (c) (3 points) Set up an integral to calculate the volume of the solid formed by rotating this region about the vertical line $x = 3$. Do NOT integrate.

   (d) (2 points) Set up an integral to calculate the volume of the solid formed by rotating this region about the y-axis. Do NOT integrate. This is a bit tricky.