

Math 142: Calculus II

Midterm 2

April 5, 2018

NAME (please print legibly): _____

Your University ID Number: _____

Indicate the lecture time you are registered for with a check in the appropriate box:

Gafni	TR 9:40-11:55pm	<input type="checkbox"/>
Gafni	TR 2:00-3:15pm	<input type="checkbox"/>
Passant	TR 3:25-4:40pm	<input type="checkbox"/>
Zeng	MW 9:00-10:15am	<input type="checkbox"/>

- You have 75 minutes to work on this exam.
- You are responsible for checking that this exam has all 11 pages.
- No calculators, phones, electronic devices, books, notes are allowed during the exam.
- **Show all work and justify all answers.** You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.
- Numerical or algebraic simplifications of answers are not required, **except when specifically stated otherwise.**
- Please sign the pledge below.

Pledge of Honesty

I affirm that I will not give or receive any unauthorized help on this exam, and that all work will be my own.

Signature: _____

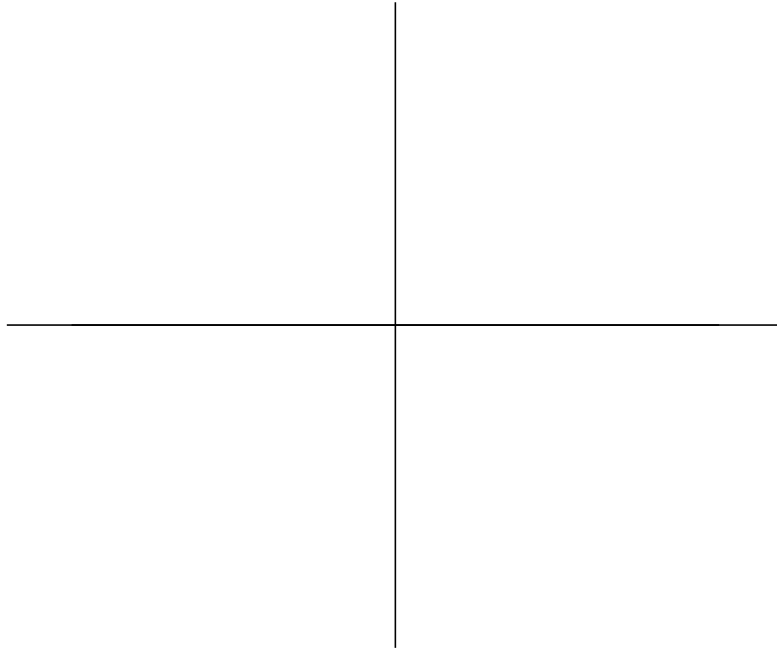
QUESTION	VALUE	SCORE
1	18	
2	18	
3	12	
4	18	
5	12	
6	22	
TOTAL	100	

1. **(18 points)** Find the area enclosed by the line $y = x$ and the parabola $y^2 = x + 6$.

2. (18 points) Let h and r be some arbitrary constants. Consider the curve

$$f(x) = \left(\frac{r}{h}\right)x.$$

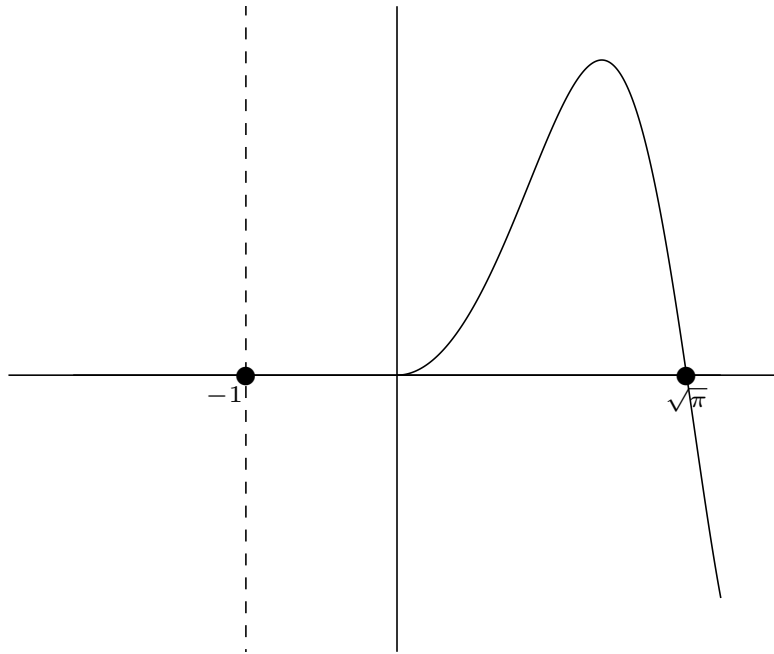
(a) On the axis below, sketch and shade the region enclosed by the curves $y = f(x)$, $y = 0$ and $x = h$.



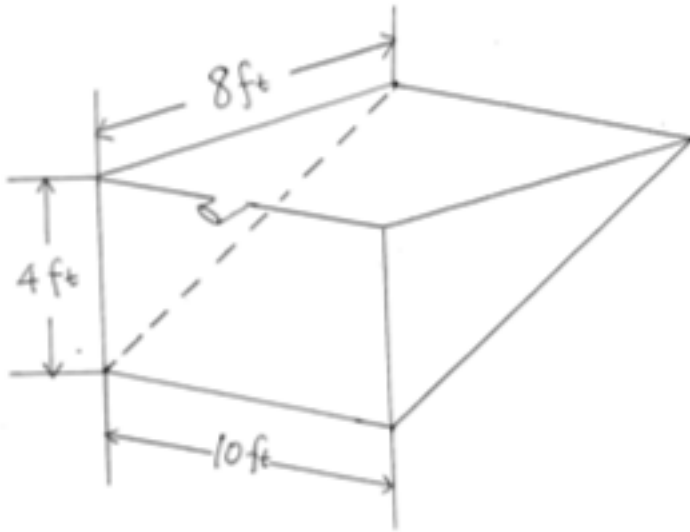
(b) What is the name of the solid formed when we rotate the region enclosed by the curves $y = 0$, $x = h$ and $y = f(x)$ around the x -axis?
[Give the name of the specific shape, e.g. “Cube”, not just “solid of revolution”]

- (c) Using the method of discs/washers, find the volume of rotation of the region enclosed by the curves $y = 0$, $x = h$ and $y = f(x)$ when rotated around the x -axis.

3. (12 points) Consider the volume obtained by rotating the region under the curve $y = \sin(x^2)$ between $x = 0$ and $x = \sqrt{\pi}$ around the line $x = -1$. Set up an integral equal to the volume of this solid. **DO NOT SOLVE THIS INTEGRAL.**



4. (18 points) A tank (see the Figure below) is full of a liquid that weighs 75 lb/ft^3 . Set up an integral that can be used to compute the work required to pump the liquid out of the spout. **DO NOT SOLVE THIS INTEGRAL.**



5. (12 points)

(a) Find the average value of the function $f(x) = 2\sqrt{x}$ on the interval $[0, 4]$.

(b) Find the point(s) in the interval $(0, 4)$ at which $f(x)$ is equal to its average value.

6. (22 points) Evaluate the following integrals.

(a) $\int x e^x dx$

(b) $\int e^{2x} \sin x dx$

Evaluate the following integral.

(c) $\int (\ln x)^2 dx$

Blank page for scratch work