

Name: \_\_\_\_\_

Panther ID: \_\_\_\_\_

Exam 2

Calculus II

Spring 2016

**Important Rules:**

1. Unless otherwise mentioned, to receive full credit you **MUST SHOW ALL YOUR WORK**. Answers which are not supported by work might receive no credit.
  2. Please turn your cell phone off at the beginning of the exam and place it in your bag, **NOT** in your pocket.
  3. No electronic devices (cell phones, calculators of any kind, etc.) should be used at any time during the examination. Notes, texts or formula sheets should **NOT** be used either. Concentrate on your own exam. Do not look at your neighbor's paper or try to communicate with your neighbor. Violations of any type of this rule will lead to a score of 0 on this exam.
  4. Solutions should be concise and clearly written. Incomprehensible work is worthless.
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1. (12 pts) Compute the area of the region located above the  $x$ -axis, and bounded by  $x = 2 - y^2$  and  $x = -y$ . Sketch and computation are required.

2. (32 pts) Compute each of the following:

(a) (10 pts)  $\int \sin^4(3x) \cos(3x) dx$

(b) (10 pts)  $\int_1^e \frac{1}{x(1 + (\ln x)^2)} dx$

(c) (12 pts)  $\int \arcsin(2x) dx$

**3.** (28 pts) Set up integrals to represent each of the following (you **do not** have to evaluate).

(a) (8 pts) The arc-length of the curve  $y = \ln x$  over the interval  $1 \leq x \leq e$ .

(b) (10 pts) The volume of the solid generated when the region bounded by  $y = \sqrt{x}$ ,  $y = 0$  and  $x = 4$  is rotated around the  $x$ -axis. Sketch of solid is required and specify if you are using slices or cylindrical shells. Just set-up the integral. Computation is **not** required.

(c) (10 pts) The volume of the solid generated when the region bounded by  $y = x^2 + 1$ ,  $y = 0$ ,  $x = 0$ ,  $x = 1$  is rotated around the line  $x = -1$ . Sketch of solid is required and specify if you are using slices or cylindrical shells. Just set-up the integral. Computation is **not** required.

4. (12 pts) A cone-shaped reservoir has the flat side at ground level and the curved side and the vertex underground. The reservoir is 18 ft in diameter across the top and is 12 ft deep. Assuming that initially the reservoir is full with a liquid of density  $\rho = 50 \text{ lbs/ft}^3$ , set up an integral that represents the work necessary to pump out all the liquid through the top of the reservoir. (It is **not** required to evaluate the integral.)

5. (12 pts) Find the formula for the surface area of a sphere of radius  $a$  by rotating the semi-circle  $x = a \cos t$ ,  $y = a \sin t$ ,  $t \in [0, \pi]$ , around the  $x$ -axis. Full computation is required.

**6.** Choose ONE (note the different point values):

(a) (10 pts) State and prove the Integration by Parts formula.

(b) (14 pts) If  $n$  is a positive integer,  $n \geq 2$ , find, with proof, a reduction formula for  $\int \sec^n x \, dx$