Math 296: Exam 2 **Name:** _____
Fall – 2017
10/18/2017
80 Minutes

Write your name on the appropriate line on the exam cover sheet. This exam contains 10 pages (including this cover page) and 9 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	15	
9	15	
Total:	100	

1. (10 points) Set up completely as possible *but do not evaluate* an integral to calculate the surface area of the surface generated by revolving the curve $f(x) = x^3$, $-1 \leq x \leq 1$, about the line...

   (a) $x = -3$.

   (b) $y = -3$.

2. (10 points) Integrate the following:

$$\int_0^\infty \frac{x}{(x^2+1)^2}\,dx$$

3. (10 points) Integrate the following:

$$\int \frac{4x^2 + 3x - 10}{x^3 + 5x^2}\, dx$$

4. (10 points) Integrate the following:

$$\int \sqrt{1-x^2}\, dx$$

5. (10 points) Integrate the following:

$$\int_1^\infty \frac{dx}{2x^2 + x}$$

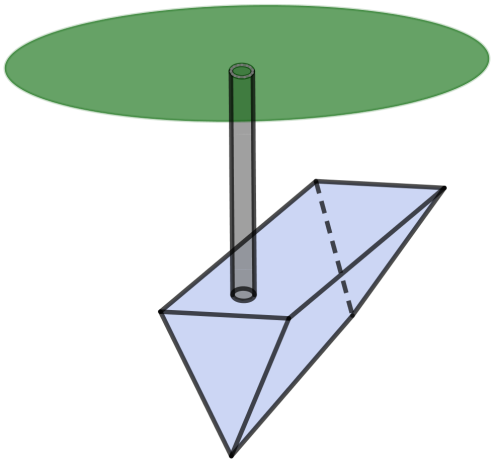
6. (10 points) Integrate the following:

$$\int \frac{dx}{\sqrt{4x^2+9}}$$

7. (10 points) Integrate the following:

$$\int \frac{2x+4}{x^3+4x}\,dx$$

8. (15 points) Shown below is a storage tank with top width 6 m, maximum depth 4 m, and length 10 m. There is a 15 m tube connecting the tank to the surface. The tank is nearly filled with only a 1 m gap between the liquids surface and the top of the tank. Assuming the tank is filled with a liquid of density ρ, find an integral expression which would calculate the amount of work required to pump the contents of the tank to the surface. *Your integral expression should be as complete as possible but you do not need to evaluate your expression.*



9. (15 points) A large drill ($18 \cdot 10^6$ kg) used in industrial mineral collection is sitting at the bottom of a mineshaft 45 m below the Earth's surface. The drill needs to be raised to the surface for repairs. If a thick steel cable weighing 50 kg/m is used to lift the drill, set up as completely as possible *but do not evaluate* an integral which would determine the work done lifting the drill to the surface.