

Math 125 F - Winter 2016  
Midterm Exam Number Two  
February 25, 2016

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

Student ID no. : \_\_\_\_\_

Signature: \_\_\_\_\_

Section: \_\_\_\_\_

1	21	
2	7	
3	12	
4	9	
5	5	
6	6	
Total	60	

- This exam consists of SIX problems on SIX pages, including this cover sheet.
- Show all work for full credit.
- You do not need to simplify your answers.
- If you use a trial-and-error or guess-and-check method when a more rigorous method is available, you will not receive full credit.
- If you run out of room, write on the back of the page, but *indicate that you have done so!*
- You may use one hand-written double-sided 8.5" by 11" page of notes.
- You may use a *scientific calculator*. Calculators with graphing, differentiation, integration, or algebraic capabilities are not allowed.
- You have 80 minutes to complete the exam.

1. [7 points per part] Evaluate these integrals!

(a)  $\int_0^4 \frac{dx}{(25 - x^2)^{3/2}}$

(b)  $\int_1^\infty \frac{x + \sqrt{x}}{x^3} dx$

Wait, hold up, there's one more part.

(c)  $\int x^2 e^{2x} dx.$

2. **[8 points]** Compute the average value of  $f(x) = \tan^6(x) \sec^6(x)$  on the interval  $[0, \frac{\pi}{4}]$ .

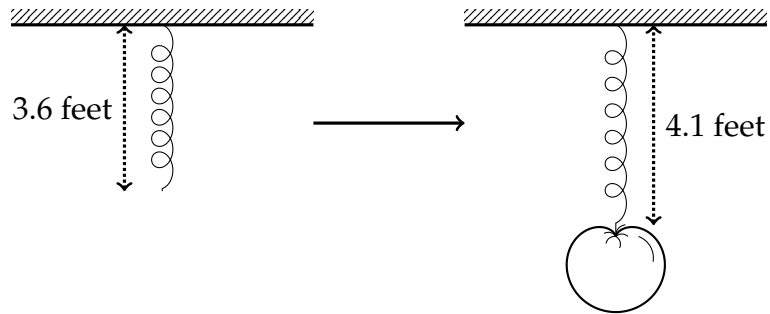
3. [12 points] Let  $\mathcal{R}$  be the region below the curve  $y = \frac{x+4}{x^2+4x+3}$  and above the  $x$ -axis between  $x = 0$  and  $x = 5$ .

Compute the volume of the solid formed by revolving  $\mathcal{R}$  around the  $y$ -axis.

4. [8 points] Recall Hooke's law, which says that the force required to compress or stretch a spring from its natural length by some distance is proportional to that distance.

A spring (of negligible mass) is suspended from the ceiling and has a natural length of 3.6 feet. When a 0.4-pound tomato is attached to the end of the spring, it stretches to a length of 4.1 feet.

Compute the work required to stretch this same spring from a length of 5 feet to 6 feet. (Express your answer in foot-pounds.)



5. **[5 points]** Use Simpson's rule with  $n = 6$  subintervals to approximate  $\int_2^5 \sin(x^2) dx$ .

Please leave your answer in exact form.

6. **[6 points]** Determine whether  $\int_0^5 \frac{e^x + \sin^2(x)}{x^2} dx$  converges or diverges.

(You do *not* need to evaluate the integral.)