

# Math 112 Exam #2

October 26, 2016

**Time:** 1 hour and 25 minutes  
**Instructions:** Show all work for full credit.  
No outside materials or calculators allowed.  
**Extra Space:** Use the backs of each sheet  
for extra space. Clearly label when doing so.

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

**ID #:** \_\_\_\_\_

**Instructor/Section:** \_\_\_\_\_

*"I pledge by my honor that I have abided by the  
NJIT Academic Integrity Code."*

\_\_\_\_\_ (Signature)

Problem(s)	Score	Total

1. Integrate  $\int x e^{-2x} dx$  (8 points)

2. Integrate  $\int \frac{5x^3 - 3x^2 + 2x - 1}{x^4 + x^2} dx$  (12 points)

3. Integrate  $\int \frac{1}{(4x^2+9)^2} dx$  (10 points)

4. Integrate  $\int \tan^3\left(\frac{x}{2}\right)\sec^3\left(\frac{x}{2}\right)dx$  (8 points)

5. Integrate  $\int \cos(\pi x)e^x dx$  (12 points)

6. Does the sequence  $\left\{\frac{1-3n}{1+2n}\right\}$  converge or diverge? If it converges, to what value do the terms converge? **(5 points)**

7. Integrate  $\int \frac{x^3}{\sqrt{1-x^2}} dx$  **(10 points)**

8. Integrate  $\int x^3 \sqrt{4 - x^4} dx$  (7 points)

9. Integrate  $\int_1^{\infty} \frac{1}{1+x^2} dx$  (7 points)

10. Integrate  $\int_0^1 \ln(x) dx$  (10 points)

11. Trapezoidal Rule is used to approximate the integral  $\int_a^b f(x)dx$  using

$T_N = \frac{\Delta x}{2}(y_0 + 2y_1 + 2y_2 + \cdots + 2y_{n-1} + y_n)$  where  $\Delta x = (b - a)/n$  and the  $y_i$ 's are evaluated at the partition points.

- a. Use this approximating technique to estimate the area under the curve  $y = mx$  over  $a \leq x \leq b$  with  $n=2$  partitions. Your answer will be in terms of the unknown constants  $a, b,$  and  $m$ . Fully simplify. **(5 points)**

- b. Integrate the general function directly over this interval. **(2 points)**

- c. The error formula for trapezoidal rule is  $|E_T| \leq \frac{f''(c)(b-a)^3}{12n^2}$  where  $c$  is chosen on the interval  $[a,b]$  to maximize  $|f''(c)|$ . Use this to explain the difference between your answers in parts (a) and (b) **(4 points)**