

Name _____

Math 125

Second Midterm

10:00 a.m., Feb. 28, 2013

(80 minutes — 100 points)

Please show all your work clearly. If you need more space, you can use the reverse side. A sheet of notes is permitted, but no calculator.

1. Find the following indefinite integrals:

(a) (17 points) $\int t^2 e^{-t} dt.$

(b) (17 points) $\int \frac{\tan \theta \sec^2 \theta d\theta}{\sec^2 \theta - 8 \sec \theta + 15}.$

(c) (17 points) $\int x^2 \operatorname{Arcsin}(x) dx.$

(CONTINUED ON NEXT PAGE)

2. (a) (12 points) Evaluate the definite integral

$$\int_1^b \frac{dx}{(x^2 + 1)^{3/2}},$$

expressing your answer in terms of b ; please simplify as much as possible. Then determine whether the improper integral as $b \rightarrow \infty$ converges or diverges; if it converges, find its value, writing your answer in exact form (simplified).

(b) (12 points) Evaluate the definite integral

$$\int_{4+\delta}^{20} \frac{dx}{(x-4)^{5/4}},$$

expressing your answer in terms of δ ; please write your answer in simplified form. Then determine whether the improper integral as $\delta \rightarrow 0$ converges or diverges; if it converges, find its value in exact form.

(CONTINUED ON NEXT PAGE)

3. (25 points) You want to find how far an object travels between $t = 0$ and $t = 30$ sec, starting at $t = 0$. You take readings of the horizontal and vertical velocities at 5-sec intervals. Let $\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ denote the seven horizontal velocity readings, and let $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ denote the seven vertical velocity readings taken during the 30-second time period. Using Simpson's rule, write an expression in terms of the α 's and β 's for the length of the object's trajectory between $t = 0$ and $t = 30$.