

Name \_\_\_\_\_

Math 125

Quiz 3 — 40 Minutes

11:40-12:20, Tuesday, Oct. 31, 2017

(3 questions, 40 points, no notes or calculator permitted)

In Problems 1 and 2, please show your work clearly, and be sure to include the constant of integration in your answer.

1. (10 points, no partial credit)

$$\int x \cos\left(\frac{2}{3}x\right) dx.$$

2. (15 points, no partial credit)

$$\int t(5t + 7)^{3/2} dt.$$

3. (15 points, no partial credit) Let  $R$  be the region above the  $x$ -axis, below the curve  $y = xe^x$ , and to the left of the line  $x = 2$ . If  $R$  is revolved around the  $x$ -axis, the resulting integral can be evaluated by applying integration by parts twice. Set up the integral and do **just the first** integration by parts. That is, your answer should have the form  $A - B \int$ , where  $A$  and  $B$  are specific numbers (written in exact form with numbers such as  $\pi$  and  $e^4$ ) and  $\int$  is a definite integral that is simpler. Do **not** evaluate this simpler integral.

## Answers

1.  $\int x \cos\left(\frac{2}{3}x\right) dx = x\left(\frac{3}{2}\right) \sin\left(\frac{2}{3}x\right) - \frac{3}{2} \int \sin\left(\frac{2}{3}x\right) dx = \frac{3x}{2} \sin\left(\frac{2}{3}x\right) + \frac{9}{4} \cos\left(\frac{2}{3}x\right) + C$
2. Setting  $u = 5t + 7$ , we get  $\int t(5t + 7)^{3/2} dt = \frac{1}{25} \int (u - 7)u^{3/2} du = \frac{1}{25} \int (u^{5/2} - 7u^{3/2}) du = \frac{1}{25} \left(\frac{2}{7}u^{7/2} - \frac{14}{5}u^{5/2}\right) + C = \frac{2}{175}(5t + 7)^{7/2} - \frac{14}{125}(5t + 7)^{5/2} + C$ . NOTE: It is also possible to evaluate this integral using integration by parts, in which case you get the equivalent answer  $\frac{2t}{25}(5t + 7)^{5/2} - \frac{4}{875}(5t + 7)^{7/2} + C$ .
3.  $\pi \int_0^2 x^2 e^{2x} dx = \frac{\pi}{2} x^2 e^{2x} \Big|_0^2 - \pi \int_0^2 x e^{2x} dx = 2\pi e^4 - \pi \int_0^2 x e^{2x} dx$ .