

Name: _____ Section: _____

Answer all questions and show your work. Unsupported answers may receive *no credit*. You may not use a calculator on this quiz. Allow 15 minutes for the quiz.

1. Find the following integrals:

(a) (5 points) $\int 2x^3 \cos(x^2) dx$

[Hint: First use the substitution $t = x^2$.]

Solution: We have $dt = 2x dx$ and, using integration by parts,

$$\int 2x^3 \cos(x^2) dx = \int t \cos(t) dt = t \sin(t) - \int \sin(t) dt = x^2 \sin(x^2) + \cos(x^2) + C.$$

(b) (5 points) $\int x^2 e^{3x} dx$

Solution: Using integration by parts twice:

$$\begin{aligned} \int x^2 e^{3x} dx &= \frac{1}{3} x^2 e^{3x} - \frac{2}{3} \int x e^{3x} dx \\ &= \frac{1}{3} x^2 e^{3x} - \frac{2}{3} \left(\frac{1}{3} x e^{3x} - \frac{1}{3} \int e^{3x} dx \right) \\ &= \frac{1}{3} x^2 e^{3x} - \frac{2}{9} x e^{3x} + \frac{2}{27} e^{3x} + C. \end{aligned}$$