

# Sample answers ~

Date: \_\_\_\_\_  
Start: \_\_\_\_\_  
End: \_\_\_\_\_  
Grader: \_\_\_\_\_

Math 31  
Integral Gateway Test

Name: \_\_\_\_\_  
ID #: \_\_\_\_\_  
Section: \_\_\_\_\_  
Instructor: \_\_\_\_\_

Find each of the indicated integrals. You need 6 out of 7 correct to pass (no partial credit). *Be careful when writing answers, since the graders have firm instructions to mark off for all errors, including missing parentheses! No calculators allowed.*

**Time Limit: 20 minutes.**

•  $\int (5x^3 + 6x - 5) dx$

$$= 5\left(\frac{x^4}{4}\right) + 6\left(\frac{x^2}{2}\right) - 5x + C$$

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•  $\int (\cos 7z)(1 + \sin 7z) dz = \int \cos 7z + \int (\sin 7z)(\cos 7z) dz$

$$u = \sin 7z$$

$$du = 7 \cos 7z dz$$

$$\frac{1}{7} du = \cos 7z dz$$

$$= \frac{1}{7} \sin 7z + \int u \left(\frac{1}{7} du\right)$$

$$= \frac{1}{7} \sin 7z + \frac{1}{7} \left(\frac{\sin^2 7z}{2}\right) + C$$

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•  $\int ze^{-5z} dz$

$$u = z \quad dv = e^{-5z}$$

$$du = dz \quad v = -\frac{1}{5} e^{-5z}$$

$$= (z) \left(-\frac{1}{5} e^{-5z}\right) - \int \left(-\frac{1}{5}\right) e^{-5z} dz$$

$$= -\frac{1}{5} z e^{-5z} - \left(-\frac{1}{5}\right) \left(-\frac{1}{5}\right) e^{-5z} + C$$

THIS TEST IS CONTINUED ON THE BACK

$$\begin{aligned} \cdot \int \frac{e^{(1/y^6)}}{y^7} dy &= \int e^{y^{-6}} (y^{-7}) dy \\ &= \int e^u du \left(-\frac{1}{6}\right) \\ &= \left(-\frac{1}{6}\right) e^{y^{-6}} + C \end{aligned}$$

$$\begin{aligned} u &= y^{-6} \quad du = -6y^{-7} dy \\ -\frac{1}{6} du &= y^{-7} dy \end{aligned}$$

$$\begin{aligned} \cdot \int \frac{(1+3\sqrt{x})^4}{\sqrt{x}} dx &= \int (1+3x^{1/2})^4 (x^{-1/2} dx) \\ &= \int u^4 \left(\frac{2}{3} du\right) \\ &= \frac{2}{3} \left(\frac{(1+3x^{1/2})^5}{5}\right) + C \end{aligned}$$

$$\begin{aligned} u &= 1+3x^{1/2} \\ du &= \frac{3}{2} x^{-1/2} dx \\ \frac{2}{3} du &= x^{-1/2} dx \end{aligned}$$

$$\begin{aligned} \cdot \int \frac{5+2\ln t}{t} dt &= \int u \left(\frac{1}{2} du\right) \\ &= \frac{1}{2} \left(\frac{u^2}{2}\right) + C \\ &= \frac{1}{2} \frac{(5+2\ln t)^2}{2} + C \end{aligned}$$

$$\begin{aligned} u &= 5+2\ln t \\ du &= 2\left(\frac{1}{t}\right) dt \\ \frac{1}{2} du &= \left(\frac{1}{t}\right) dt \end{aligned}$$

$$\begin{aligned} \cdot \int \frac{5t}{4-3t^2} dt &= \int \left(\frac{1}{u}\right) \left(-\frac{5}{6} du\right) \\ &= \left(-\frac{5}{6}\right) \ln |4-3t^2| + C \end{aligned}$$

$$\begin{aligned} u &= 4-3t^2 \\ du &= -6t dt \\ -\frac{5}{6} du &= 5t dt \end{aligned}$$