

Please show **all** your work! Answers without supporting work will not be given credit.
Write answers in spaces provided.

Name: _____

1. [3 pts] Compute $\int \frac{8 \sin(3x)}{\cos^6(3x)} dx$

Solution:

$$\begin{aligned} \int \frac{8 \sin(3x)}{\cos^6(3x)} dx & \stackrel{\substack{u=\cos(3x) \\ du=-3 \sin(3x) dx \\ \frac{du}{-3}=\sin(3x) dx}}{=} \int -\frac{8}{3} \frac{du}{u^6} \\ & = -\frac{8}{3} \int u^{-6} du \\ & = -\frac{8}{3} \cdot \frac{1}{-5} u^{-5} + C \\ & = \frac{8}{15} (\cos(3x))^{-5} + C \\ & = \frac{8}{15} \sec^5(3x) + C \end{aligned}$$

How I graded?

- 1 pt for u-substitution
- 1 pt for integration
- 1 pt for plugging u back

2. [3 pts] Compute $\int \frac{6x}{\sqrt{x+1}} dx$.

Solution:

$$\begin{aligned} \int_1^3 \frac{6x}{\sqrt{x+1}} dx & \stackrel{\substack{u=x+1 \\ x=u-1 \\ du=dx}}{=} \int \frac{6(u-1)}{u^{1/2}} du \\ & = 6 \int u^{1/2} - u^{-1/2} du \\ & = 6 \left(\frac{2}{3} u^{3/2} - \frac{2}{1} u^{1/2} \right) + C \\ & = 4(x+1)^{3/2} - 12(x+1)^{1/2} + C \end{aligned}$$

How I graded?

- 1 pt for u-substitution
- 1 pt for integration
- 1 pt for plugging u back

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3. [4 pts] An alien plant grows at the rate $H'(t) = \frac{1}{\sqrt[3]{8t+3}}$ inches per day, t days after it was planted. How many inches will the height of the plant change on the third day? (Round your answer to three decimal places.)

Solution: SET-UP: $\int_2^3 H'(t) dt = \int_2^3 \frac{1}{\sqrt[3]{8t+3}} dt$

Now solve.

$$\int_2^3 \frac{1}{\sqrt[3]{8t+3}} dt \stackrel{\substack{u=8t+3 \\ \frac{du}{dt} = 8}}{\frac{du}{8} = dt} \int \frac{1}{u^{1/3}} \frac{du}{8}$$

$$= \frac{1}{8} \int u^{-1/3} du$$

$$= \frac{1}{8} \cdot \frac{3}{2} u^{2/3}$$

$$= \frac{3}{16} (8t+3)^{2/3} \Big|_2^3$$

$$= 0.352$$

How I graded?

- 1 pt for Set-Up
- 1 pt for u-substitution
- 0.5 pt for integration
- 0.5 pt for plugging u back
- 1 pt for Final Answer