Quiz 6A, Business Calculus

Fall 2014 - Dr. Graham-Squire

10:46
10:50

Name: Key

1. (4 points) Calculate the antiderivative (indefinite integral) using u-substitution.

$$\int 12x^2(2x^3+5)^7\,dx$$

$$= \int 12x^2 (u)^7 \cdot \frac{du}{6x^2} \quad \checkmark$$

$$= \int 2u^7\,du$$

$$= 2\left(\tfrac{1}{8}\cdot u^8\right) + C$$

$$= \tfrac{1}{4}(2x^3+5)^8 + C$$

$u = 2x^3+5$ ✓✓

$du = 6x^2\,dx$ ✓

$\frac{du}{6x^2} = dx$

2. (3 points) A population of wombats triples in size over the course of ten years. Assuming that the population is modeled with an exponential growth model, and the growth continues at the current rate, how many years will it take before the population grows to four times its original size?

$A = Pe^{rt}$ ✓

$\frac{3P}{P} = \frac{Pe^{r10}}{P}$ ✓

$3 = e^{10r}$

$\ln 3 = \ln e^{10r}$

$\frac{\ln 3}{10} = \frac{10r}{10}$

$\frac{\ln 3}{10} = r$ ✓

$A = Pe^{\frac{\ln 3}{10}t}$ ✓

$\frac{4P}{P} = \frac{Pe^{\frac{\ln 3}{10}t}}{P}$

$4 = e^{(\frac{\ln 3}{10})t}$

$\ln 4 = (\frac{\ln 3}{10})t$ ✓

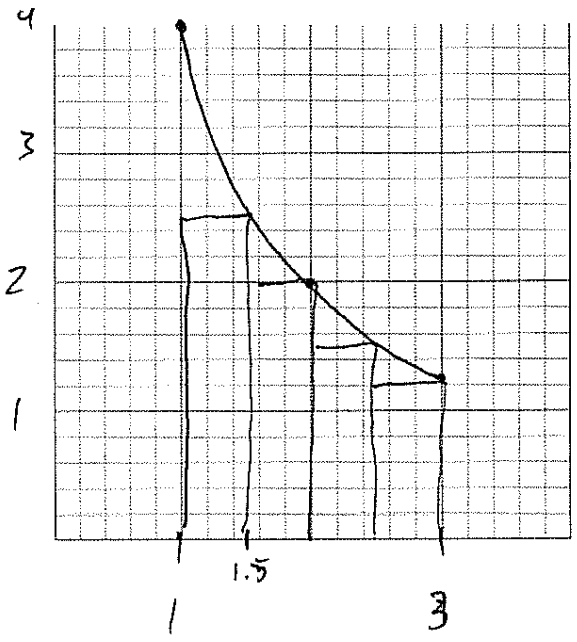
$\frac{\ln 4}{(\frac{\ln 3}{10})} = t$

$\boxed{t = 12.6}$ ✓

12.6 years

↑ round to nearest 0.1 yrs.

3. (3 points) Use a Riemann sum to approximate the area under the curve $y = \frac{4}{x}$, using *right* endpoints and four subintervals, for the interval [1,3]. Show/explain your work.



$\text{Area} \approx 0.5\left(f(1.5)+f(2)+f(2.5)+f(3)\right)$

$= 0.5\left(\frac{4}{1.5}+\frac{4}{2}+\frac{4}{2.5}+\frac{4}{3}\right)$

$= \frac{4}{3}+1+\frac{4}{5}+\frac{2}{3}$

$= \boxed{3.8}$

← is your answer an over or under estimate

(b) Underestimate b/c rectangles are below the curve.