

Quiz 6A, Business Calculus

Spring 2017 - Dr. Graham-Squire

5:48

⇒ give 20 → 25 ml

Name: _____

Key

1. (3 points) Calculate the derivative, $f'(x)$, for the given function. You should also simplify your answer (either before or after you take the derivative).

⇒

$$f(x) = \ln\left(\frac{x^3}{\sqrt{x-4}}\right)^5$$

$$f(x) = 5 \ln\left(\frac{x^3}{\sqrt{x-4}}\right)$$

$$f(x) = 5(\ln x^3 - \ln (x-4)^{1/2})$$

$$f(x) = 5\left(3 \ln x - \frac{1}{2} \ln (x-4)\right)$$

$$f'(x) = 5\left(3 \cdot \frac{1}{x} - \frac{1}{2} \cdot \frac{1}{x-4} \cdot 1\right)$$

1.5 for simp

1.5 for deriv.

$$\text{or } \left[\frac{15}{x} - \frac{5}{2(x-4)} \right]$$

2. (2 points) Calculate the antiderivative:

$$\int (e^x + x(x-9)) dx$$

$$= \int e^x dx + \int (x^2 - 9x) dx$$

$$= \int e^x dx + \int x^2 dx - \int 9x dx$$

$$= e^x + \frac{x^3}{3} - 9\left(\frac{x^2}{2}\right) + C$$

Mark, no points off.

3. (5 points) The length of wombats (in centimeters) raised in captivity is modeled by the function

$$L(t) = 200(1 - 0.947e^{-0.17t})$$

where t is days after birth. Make sure to show your work for each of the following questions. Round all answers to the nearest 0.1.

- (a) What is the length of a 2 day old wombat?
 (b) How long does it take for a wombat to grow to 100 cm?
 (c) How fast is the wombat growing when it is 5 days old?

✓ (a) $L(2) = 65.1907 = \boxed{65.2 \text{ cm}}$

2 (b) $\frac{100}{200} = \frac{200}{200} (1 - 0.947e^{-0.17t})$

$$0.5 = 1 - 0.947e^{-0.17t}$$

$$\frac{-0.5}{-0.947} = \frac{-0.947e^{-0.17t}}{-0.947}$$

$$\ln 0.527983 = \ln e^{-0.17t}$$

$$\frac{\ln 0.527983}{-0.17} = \frac{-0.17t}{-0.17}$$

$t = 3.757$
 $\boxed{t = 3.8 \text{ days}}$

2 (c) $L'(t) = 200(0 - 0.947e^{-0.17t} \cdot (-0.17))$

$$L'(5) = 200(0.947)(0.17)e^{-0.17 \cdot 5}$$

$$= 13.76$$

$$\Rightarrow \boxed{13.8 \text{ cm/day}}$$