Quiz 2A, Business Calculus

Spring 2017 - Dr. Graham-Squire

6 min

$\Rightarrow$ give 25 min

Name: Key

1. (3 points) Use the definition of the derivative (4-step process) to calculate $f'(x)$ if $f(x) = 5x^2$. (Note: you can use derivative rules to check your answer, but you will only receive points for using the definition of the derivative.) Make sure to use correct notation!

✓ $f(x+h) = 5(x+h)^2 = 5(x^2+2xh+h^2) = 5x^2+10xh+5h^2$

0.5 $f(x+h) - f(x) = \cancel{5x^2}+10xh+5h^2-(\cancel{5x^2})$

0.5 $\dfrac{f(x+h)-f(x)}{h} = \dfrac{10xh+5h^2}{h} = \dfrac{\cancel{h}(10x+5h)}{\cancel{h}} = 10x+5h$

✓ $f'(x) = \lim_{h\to 0}\left(\dfrac{f(x+h)-f(x)}{h}\right) = \lim_{h\to 0} 10x+5h = 10x+\cancel{5(0)} = \boxed{10x}$

+0.5 for power rule

−0.5 if no notation / confusing

Nothing off if just missing $\lim_{h\to 0}$ but they do it right.

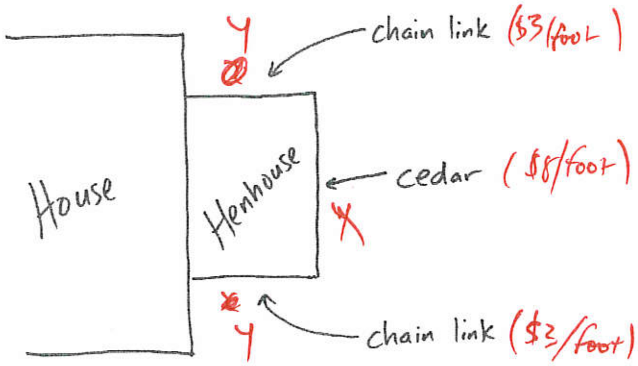
2. (4 points) Aya wants to build a rectangular henhouse on the side of her house, and the henhouse must have an area of 400 ft^2. Aya wants the side facing her neighbors (parallel to her own house) to look nice, so it will be made of cedar which will cost \$8 per running foot. The other two sides (perpendicular to Aya's house) will be of chain link fencing, at a cost of \$3 per running foot. Those are the only costs associated with the henhouse. The diagram below shows how it will be set up. Answer the following questions:

(a) If Aya uses 40 feet of cedar fencing, how long must each of the chain link sides be? (Assuming the area must be 400 ft^2.)

(b) If Aya uses 40 feet of cedar fencing, how much will it cost to build the henhouse?

(c) If Aya used only 20 feet of cedar fencing, how much will it cost her to build the henhouse? (Again, assuming the area must be 400 ft^2.)

(d) If Aya uses x feet of cedar fencing, write an equation(in terms of x) to represent how much it will cost to build the henhouse.



(a) Area $= x \cdot y \Rightarrow 400 = y(40) \Rightarrow y = \boxed{10 \text{ feet}}$ ✓

(b) so cost $= \$3(20) + \$8(40) = \boxed{\$380}$ ✓

(c) $x = 20 \Rightarrow 400 = 20y \Rightarrow y = 20,$

so Cost $= \$3(40) + \$8(20) = 60 + 160 = \boxed{\$280}$ ✓

(d) Cost $= 2(3y) + 8x$ dollars and $400 = xy$

$\Rightarrow \frac{400}{x} = y$

$\boxed{\text{Cost} = 2\left(3\left(\frac{400}{x}\right)\right) + 8x}$ ✓

or $\boxed{C(x) = \frac{2400}{x} + 8x}$

3. (3 points) Find the limits of the following, *without* using a calculator. It is fine to use a calculator to check your work, but you should show enough work (and use correct notation) to demonstrate how to find the limit without a calculator.

(a) $\lim_{x \to 4} \frac{x^2 - 16}{x^2 - 9x + 20}$ $\rightarrow \frac{4^2-16}{4^2-9(4)+20} = \frac{0}{0}$ 0.5

$$= \lim_{x \to 4} \frac{(x+4)\cancel{(x-4)}}{\cancel{(x-4)}(x-5)} = \lim_{x \to 4} \frac{x+4}{x-5} = \frac{8}{-1} = \boxed{-8}$$

0.5 0.5

✓

(b) $\lim_{x \to (-3)} \frac{x^2 - 4x - 21}{x^2 + 7x - 30}$ $\rightarrow \frac{(-3)^2-4(-3)-21}{(-3)^2+7(-3)-30} = \frac{9+12-21}{9-21-30} = \frac{0}{-42} = \boxed{0}$

✓

if no limit notation and DNE instead of zero, take of -0.5 only