BC Calculus
Application of Derivative: Review

Name_____Pd.___
Date_____Seat #___

Please start off every review with reading your notecards for that unit several times!!!!! This is a very limited review!!!!

Related Rates- Find the rate of change of….
We also called these Know, Find, When…..
Identify- Know, Find, & When from problem
Draw a picture and label all parts. Unless it is a formula problem.
Know & Find: You will be given… & asked to find $\frac{d(\text{something})}{dt}$ ex: rate of change of radius=$\frac{dr}{dt}$
When: Is normally a length it could be a time Ex: when radius is 10
Equation: You will be given or you will need to come up with an equation that relates Know & Find.
Derivative: always take a derivative with respect to time. $\frac{d}{dt}[Equation]$
Substitute: Know & When and solve for Find.

Key:
1-C 2-A 3-A 4-C 5-C
6-B 7-C 8-B 9-B 10-A

Optimization-Find the max/min, largest/smallest, farthest/closest or any other synonym for max/min.
Take a derivative, set equal to zero, and solve.
You must check the endpoints.

Absolute Extrema- Different than relative because relative happen when f(x) change from increasing to decreasing or decreasing to increasing. Absolute you have to find the y-values and check the endpoints. The largest or smallest y-value is the absolute extrema

LHopital's Rule- If you are finding the limit of a function and you get an indeterminant form:
$\frac{0}{0}$ *or* $\frac{\infty}{\infty}$ *or* $\infty-\infty$ *or* 0^0
You can take a derivative of the top and bottom separately and try direct substitution again.

Practice:

1.A 20-foot ladder leans against the wall of a building. The ladder starts sliding down the wall so the top of the ladder moves down at the rate of .5 ft/sec. How fast is the foot of the ladder moving away from the wall when the foot of the ladder is 12 feet from the wall?

a.) $\frac{1}{2}\frac{ft}{\sec}$
b.) $\frac{5}{8}\frac{ft}{\sec}$
c.) $\frac{2}{3}\frac{ft}{\sec}$
d.) $\frac{4}{3}\frac{ft}{\sec}$
e.) $\frac{8}{3}\frac{ft}{\sec}$

2. A spherical balloon is filled with air at 8 in^3/sec. How fast is the diameter of the balloon increasing when the volume of the balloon is 36π in? $\left(\text{volume of a sphere} = V = \frac{4}{3}\pi r^3\right)$

a.) $\frac{4}{9\pi}\frac{in}{\sec}$
b.) $\frac{2}{3\pi}\frac{in}{\sec}$
c.) $\frac{2}{9\pi}\frac{in}{\sec}$
d.) $\frac{8}{27\pi}\frac{in}{\sec}$
e.) $\frac{2}{27\pi}\frac{in}{\sec}$

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3. The profit function for a manufacturer of apple watches is approximately $P(x) = -0.02x^2 + 320x - 100{,}000$, where x denotes the number of clocks made. What is the maximum profit?

a.) \$1,180,000
b.) \$1,280,000
c.) \$1,380,000
d.) \$1,480,000

4. $g(x) = -x^2 + 11x - 30,\ 5 \le x \le 6$

a.) Absolute max is $\frac{5}{4}$ at $x = \frac{13}{2}$ &
Absolute min is 0 at $x = 5$ & 6

b.) Absolute max is $\frac{241}{4}$ at $x = \frac{11}{2}$ &
Absolute min is 0 at $x = 5$ & 6

c.) Absolute max is $\frac{1}{4}$ at $x = \frac{11}{2}$ &
Absolute min is 0 at $x = 5$ & 6

d.) Absolute max is $\frac{1}{4}$ at $x = \frac{13}{2}$ &
Absolute min is 0 at $x = 5$ & 6

5. Locate the absolute extrema of the function $f(x) = x^3 - 12x$ on the closed interval $[0,4]$.

a.) Absolute max: $(2,-16)$;
Absolute min: $(4,16)$

b.) Absolute max: none;
Absolute min: $(4,16)$

c.) Absolute max: $(4,16)$;
Absolute min: $(2,-16)$

d.) Absolute max: $(4,16)$;
Absolute min: none

e.) No Absolute Max or Min

6. If $y = 2x - 8$, what is the minimum value of the product xy?

a.) -16
b.) -8
c.) -4
d.) 0
e.) 2

7. $\lim_{x \to 10} \frac{-9(x-10)}{x^2 - 100} =$

a.) $\frac{9}{20}$
b.) $-\frac{9}{100}$
c.) $-\frac{9}{20}$
d.) 0
e.) Does not exist

8. $\lim_{x \to 0} \frac{1 - \cos(9x)}{6x^2} =$

a.) $\frac{3}{2}$
b.) $\frac{27}{4}$
c.) 0
d.) $\frac{3}{4}$
e.) Does not exist

9. A sphere is increasing in volume at the rate of $3\pi\ cm^3/s$. At what rate is the radius changing when the radius is $1/2\ cm$

$\left(\text{volume of a sphere} = V = \frac{4}{3}\pi r^3\right)$

a.) π b.) 3 c.) 2 d.) 1 e.) 1/2

10. We need to enclose a field with fence. We have 500 feet of fencing material and a building is on one side of the field and so won't need any fencing. Determine the dimensions of the field that will enclose the largest area.

a.) 250 by 125
b.) 150 by 200
c.) 125 by 100
d.) 200 by 150