Contextual Applications of Differentiation **UNIT 4 REVIEW** **AP Calc April 16, 2020**

4.1 Interpreting the Meaning of the Derivative in Context
4.2 Straight-Line Motion: Connecting Position, Velocity and Acceleration ** WATCH AP LIVE #10 "8.2" **
4.3 Rates of Change in Applied Contexts Other Than Motion
4.4 Introduction to Related Rates / 4.5 Solving Related Rates Problems
4.6 Tangent Line Approximations
4.7 L'Hospital's Rule (sometimes L'Hôpital's)

4.1 The function $C(x)$ gives the cost of digging a hole x feet deep.

$\boldsymbol{C(20) = 140}$ means that a hole __________ deep costs ___________ to dig.

$\boldsymbol{C'(20) = 5}$ means that when the hole is _____________________, the cost of digging is _______________ at a rate of __________________________.

4.2 A particle moves back and forth on a horizontal track for $0 \le t < \frac{\pi}{2}$ minutes. The particle's position, in feet, is given by the function $s(t) = \frac{1}{2}\tan t$. Find the acceleration of the particle at time $t = \frac{\pi}{6}$ minutes and indicate units of measure.

4.3 If $P(t)$ models the size of a population at time $t > 0$, which of the following differential equations describes linear growth in the size of the population? Which describes exponential growth?

$\frac{dP}{dt} = 200$	$\frac{dP}{dt} = 200t$	$\frac{dP}{dt} = 100t^2$	$\frac{dP}{dt} = 200P$	$\frac{dP}{dt} = 100P^2$

4.4 Determine $\frac{dz}{dt}$ if you know that $z = xy^2$, $z = 3$, $y = \frac{1}{2}$, $\frac{dx}{dt} = -2$, and $\frac{dy}{dt} = 5$.

4.5 Free Response Question (FRQ) Practice in a bit!!

4.6 Given $g(x)$ is a differentiable function about which little else is known other that $g(-3) = 2$ and $g'(-3) = 7$. Use the tangent line of $g(x)$ at $x = -3$ to approximate $g(-2.9)$.

4.7 $\lim_{x \to 5} \frac{x^4 - 625}{x^2 - 25}$