

Math-UA 121: Worksheet Four

Sharada Sridhar

February 26, 2016

Section 2.2 and 2.3

- The equation of the motion of a piece of popcorn exploding out of Max's limo is $s = \frac{\sin t}{1 + \sin t}$ for $t \in (0, \frac{\pi}{2})$.
 - Find the velocity at time t .
 - What is the velocity at time $t = \frac{\pi}{3}$?
 - When is the popcorn at rest?
 - What is the popcorn moving in the positive direction?
 - Find the acceleration at time t and after the first $\frac{\pi}{3}$ seconds.
- Find the equations of the line(s) (if any) through the given point that are tangent to the indicated function.
 - $y = 3x^2 + 4$, $(0, 0)$
 - $f(x) = \frac{x+1}{x-1}$, $(-2, 4)$
 - $h(\alpha) = \frac{\alpha-1}{\alpha^2+4\alpha-5}$, $(-8, 1)$
- Find $g'(4)$ where $g(x) = (x^2 + 1)f(x)h(x)$, $f(x)$ is a line containing the points $(2, 1)$ and $(3, 2)$ and $h'(4) = h(4) = 1$.
- Differentiate the following and find the equation of the tangent line at the indicated points. Except for the starred (*) questions, determine in what intervals the function is increasing, decreasing or neither.
 - $f(x) = 3x^3 + 4x + 2$, $x = 4$
 - $f(x) = \sin x \cos x$, $x = \frac{2\pi}{3}$ (Hint: consider double angle formulas)
 - $f(x) = \frac{x}{x^2+1}$, $x = 1$
 - $f(x) = \tan x \cos x - \sin x$, $x = \frac{5\pi}{6}$
 - $f(x) = \frac{\sqrt{x}}{x-7}$, $x = 5$
 - $f(x) = \frac{x^2-4}{x^2-5x+6}$, $x = 2$
 - $f(x) = \frac{\sqrt{2x-7}}{\sin x}$, $x = 16$
 - $f(x) = \frac{1-x^2}{1+x^2}$, $x = -1$
 - * $f(x) = e^x \csc x - \frac{x}{e^x}$, $x = \ln 2$
 - * $f(x) = \frac{\tan x}{2 \sec x} (3x + 7) - \frac{2 \cot x}{\cos x} (2x + 9)$, $x = 0$