

# APPM 1350 Recitation, Fall 2021, Week 5, Sep 21

## 1

Use the limit definition to find the derivative of the following functions at the given points:

a)  $f(x) = \frac{1}{x}$  at  $x = 2$ .

b)  $g(x) = |x - 6|$  at  $x = 6$ .

c)  $g(x) = \sqrt{9 - x}$  at any  $x$ .

## 2

Find the derivatives of the following functions:

a)  $f(x) = x^2 + \frac{4}{x^3}$

b)  $g(x) = A \cos(x) + B \sin(x) + C$  ( $A$ ,  $B$ , and  $C$  are constants)

c)  $h(x) = \frac{\sqrt[10]{x}}{50} - \frac{19}{\sqrt[4]{x}}$

d)  $y(x) = \frac{\sqrt{x+x^2}}{x}$

## 3

Suppose we a weight hanging from spring. The spring is bouncing up and its position relative to the ground at any time  $t$  is given by

$$p(t) = 2 \sin(t) + 5.$$

a) For any time  $t > 0$ , find the instantaneous velocity of the weight.

b) At what times does the weight change directions?

c) What is the maximum and minimum height of the weight

## 4

a) Find the equation of the line that is tangent to the given function at the given point:

$$y = \sqrt{x} + 5 \sin(x) \text{ at } (\pi, \sqrt{\pi}).$$

b) Find the equation of the line that is normal to  $y = x - \sqrt{x}$  at the point  $(4, 2)$ .

c) Find the equation of the line tangent to the curve  $y = x\sqrt{x}$  and parallel to the line  $-3x + y = 1$ .

## 5

Prove that  $\frac{d}{dx}[f(x) - g(x)] = \frac{d}{dx}f(x) - \frac{d}{dx}g(x)$  using the limit definition of the derivative.