

Group nr. _____ NAMES: _____

MAC 2281: Worksheet Feb. 26, 2019

1) Use method shown in class to obtain the formula for dy/dx when $y = \arccos x$.

2) Compute the derivative of each of the following functions. Simplify, if possible.

(a) $y = \arcsin(\cos(3x))$

(b) $y = x \arctan(\ln x)$

3) Show that the function $f(x) = 2x^3 + 6x - 5$ is one to one and then find $(f^{-1})'(3)$. Note that $f(1) = 3$.

4) (Lysis of a bacterium): A spherical bacterium has its cell wall perforated. As a result, water flows into the bacterium at 100 cubic micrometers per second.

a) What is the rate of change of the radius at the instant that the radius is 30 micrometers?

b) What is the rate of change of the surface area at the instant that the radius is 30 micrometers?

5) Suppose that a cylindrical tank is being filled with water at a rate of $100 \text{ cm}^3/\text{min}$. If the tank has a radius of 50 cm, at what rate is the height of water in the tank changing when the tank is 100 cm full?

6) A telescope on the ground is tracking a rocket which is rising vertically from a launchpad. The telescope is 5 kilometers from the launchpad and denote by θ the angle with respect to which the telescope observes the rocket above the ground. Suppose that at the moment when the rocket is 10km above the ground, the angle θ is increasing at a rate of one degree per second. What is the vertical speed of the rocket at that moment?