

MAT265 HOMEWORK 05

Due Date: February 24, 2016

Name: \_\_\_\_\_

**Instructions:** The following exercises are similar to those found in the course text book [related text book question are in brackets]. Show ALL your work and write neatly. This assignment is due at the beginning of the class period on the date above. Group work is allowed and encouraged, but each member must write up his/her own solutions. Submissions without staples, without a name, or without work shown *will not receive credit*.

1. [§2.6, #30] Use implicit differentiation to find an equation of the tangent line to the curve

$$2 = -x^2 + 2\sqrt{3}xy + y^2$$

at the point  $(0, -\sqrt{2})$ .

2. [§2.7, #2]

a. If  $A$  is the area of a circle with radius  $r$  and the circle expands as time passes, find  $\frac{dA}{dt}$  in terms of  $\frac{dr}{dt}$ .

b. During an exhibition, artist Damien Hirst pours red paint onto the ground and it spreads in a circular fashion. If the radius of this paint is increasing at a constant rate of 8 in/s, how fast is the area increasing when the radius is 29 in?

3. [§2.7, #4] A rectangle of fixed perimeter is has length  $\ell$  increasing at 5 cm/s and the width  $w$  is decreasing at 5 cm/s. How fast is the area increasing when the length is 20 cm centimeters and the width is 30 cm? When the length is 40 cm and the width is 10 cm, is the area increasing or decreasing?
4. [§2.7, #6] A perfectly spherical balloon is being inflated so that the radius is increasing at a rate of 3 mm/s. How fast is the volume increasing when the radius is 75 mm?
5. [§2.7, #12] At 12:00PM a FedEx truck is 100 miles east of a UPS truck. The FedEx truck is driving west at a 55 mi/h and the UPS truck is driving north at 75 mi/h. How fast is the distance between these trucks changing at 2:00PM?
6. [§2.7, #24] Water is being pumped into an inverted conical tank at a constant rate of  $10\text{ft}^3/\text{min}$ . At the exact same time, water is leaking out of the tank at a constant rate. The tank is 7 ft tall and has a radius of 9 ft. If the water level is decreasing at a rate of 1 ft/min when the height of the water is 3 ft, what is the rate at which the water is leaking out of the tank?