Worksheet 10-20-15 - Review for Exam 2 - MAC 2311 **NAME:** ____________________

1. (a) Find the local linear approximation of $f(x) = x^{3/2}$ at $x_0 = 4$.

(b) Use the local linear approximation in part (a) to estimate $(3.92)^{3/2}$.

2. The edge of a cube was found to be 30 cm with a possible error in measurement of 0.1 cm.

(a) Use differentials to estimate the error in the calculated volume.

(b) Use differentials to estimate the percentage error in the calculated volume.

3. Use differentials to estimate the volume of paint needed to apply a coat of paint 0.1 cm thick to a hemispherical dome with diameter 50 m.

4. A water tank has the shape of an inverted circular cone with the base radius of 3 m and height 4 m. If water is being pumped in the tank at a rate of $2\text{m}^3/\text{min}$, find the rate at which the water level is rising when the water in the tank is 1 m deep.

5. If two resistors with resistances R_1 and R_2 are connected in parallel, then the total resistance R, measured in ohms (Ω), is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}\,.$$

If R_1 is increasing at a rate of 0.3 Ω/s, but R_2 is decreasing at a rate of 0.3 Ω/s, respectively, how fast is R changing when $R_1 = 100\Omega$ and $R_2 = 80\Omega$? Is R increasing or decreasing?

6. The equation $x^2 - xy + y^2 = 3$ represents a "rotated ellipse", that is, an ellipse whose axes are not parallel to the coordinate axes. Find the points at which this ellipse crosses the y-axis and show that the tangent lines at these points are parallel.

7. Find dy/dx. Simplify when possible:

(a) $y = \dfrac{x^3}{3} - 2\sqrt{x} + 10^6$

(b) $y = e^{3x}\sec x$

(c) $y = \dfrac{1}{2x + \sin^3 x}$

(d) $y = \arcsin(\cos x)$

(e) $y = (\ln x)^x$

8. If $f(x) = \sin(2x)$, determine $f^{(2014)}(x)$.

9. The function $h(x)$ is given by $h(x) = \frac{f(x)}{1+x^2}$. Given that $f(2) = 5$ and $f'(2) = 1$, find

(a) (3 pts) $h(2)$

(b) (7 pts) $h'(2)$

10. Find the equation of the tangent line to the curve $3x - x^2y^2 = 2y^3$ at the point $(1, 1)$.