Math 1300-018 Quiz 7 Name:_____

DUE MONDAY AT THE BEGINNING OF CLASS - SHOW ALL YOUR WORK. Use additional paper as necessary.

1. Differentiate the following functions:

   (a) $a^x + x^a, a > 0$ constant

   (b) $f(x)g(h(x))$

   (c) $\sqrt{x + \sqrt{x + \sqrt{x}}}$

   (d) $\dfrac{\log_2 x}{3^{x^2+x+1}}$

   (e) $f(x)^{g(x)}$

   (f) $x \ln x - x$

   (g) $\dfrac{(3x+2)^4(2x-3)^{1/4}}{(x + x^{-1}) \ln x}$

   (h) $xe^x \tan x$

   (i) $\dfrac{f(x)}{g(x) - h(x)}$

   (j) $7^{\sin(\pi z)}$

   (k) $\ln(\ln(\ln x))$

   (l) $\arccos(e^t) - \cos(e^{-t})$

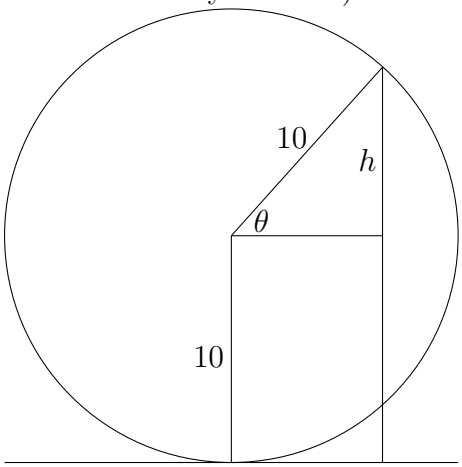
   (m) $\sqrt{y}^{\sqrt{y}}$

   (n) $\left(\arctan\left(\dfrac{x}{2}\right)\right)^{2/3}$

   (o) $\cos(\sin x) \tan(\cot x)$

2. Consider the function
$$h(x) = (1+x)^p.$$
   (a) Find the linearization (best linear approximation) of $h(x)$ near $x = 0$.
   (b) For what values of p is this an overestimate or underestimate? [Hint: Consider the second derivative of h.]

3. A ferris wheel with a radius of 10 meters is rotating at a rate of one revolution every two minutes. How fast is a rider rising when his seat is 16 meters above the ground? (Assume the bottom of the ferris wheel is at ground level. Use the picture below or draw your own.)



4. An $x \times y \times z$ box is shrinking. If
$$x(0) = 2,\ y(0) = 4,\ z(0) = 6 \text{ and } \left.\frac{dx}{dt}\right|_{t=0} = 3,\ \left.\frac{dy}{dt}\right|_{t=0} = 5,\ \left.\frac{dz}{dt}\right|_{t=0} = 7,$$
what is $\left.\dfrac{dS}{dt}\right|_{t=0}$, where S is the surface area of the box (all six sides)?