MATH 101 QUIZ 4

1. Find the slope of the tangent line of the curve $\tan^{-1}(x^2y) = \frac{\pi}{8}(x + xy^2)$ at the point $(1, 1)$ on the curve.

2. Find the slope of the tangent line of the curve $y = x^{\cos x}$ at $x = \pi/3$.

3. Suppose the position of a particle moving along the real line is given by

$$s = t^4 - 4t^3 - 2t^2 + 12t, \quad t \geq 0.$$

Find the interval of time t when the particle is moving in the negative direction.

4.

(1) Let v and s be the volume and the surface area of a ball. Express v as a function of s. (*Hint.* If r is the radius of the ball, then $v = 4\pi r^3/3$ and $s = 4\pi r^2$. Express r as a function of s from the second equation and put it into the first one.)

(2) Suppose that a balloon is being deflated so that its volume is decreasing with the rate $1\,cm^3/s$. Then how fast is the surface area decreasing when the surface area is $400\,cm^2$?