Instructions: Write your name at the top. You have ten minutes to complete this quiz. Show your work as clearly as possible. No calculators, books, or notes are allowed.

1. Find the slope of the tangent line to the curve \( \sin(x + 2y) = y^2 \) at the point \((0,0)\). (For extra credit, show that the point \((0,0)\) actually lies on this curve.)

\[
(0,0) \text{ lies on the curve } \because \sin(0+2\cdot0) = \sin(0) = 0 = 0^2. \\
\text{So } x=0, y=0 \text{ satisfies the eqn } \sin(x+2y) = y^2.
\]

To calculate the slope of the tangent line, we find \( \dfrac{dy}{dx} \) by implicit diff'ing:

\[
\frac{d}{dx} (\sin(x+2y)) = \frac{1}{\cos(x+2y)} \cdot \frac{d}{dx} (x+2y).
\]

Now \( \cos(x+2y) + 2\cos(x+2y) \cdot \frac{dy}{dx} = 2y \cdot \frac{dy}{dx} \), so

\[
\frac{dy}{dx} = \frac{2y}{2y - \cos(x+2y)}.
\]

At \((0,0)\), \( \frac{dy}{dx} = \frac{\cos(0)}{2 - \cos(0)} = \frac{1}{2} \).

2. a) If \( f(x) \) is a one-to-one, invertible function with inverse \( g(x) \), what is the formula for \( g'(x) \)?

\[
g'(x) = \frac{1}{f'(g(x))}.
\]

b) Using the above formula and the appropriate triangle or trigonometric identity, compute the derivative of \( \arccos(x) \).

\[
\frac{d}{dx} \arccos(x) = -\frac{1}{\sqrt{1-x^2}}. \quad \text{Let } \arccos(x) = \theta.
\]

Then we have a triangle \( \triangle \frac{1}{\theta} \sqrt{1-x^2} \), so

\[
\sin(\arccos(x)) = \sin(\theta) = \sqrt{1-x^2} \quad \text{and} \quad \frac{d}{dx} \arccos(x) = -\frac{1}{\sqrt{1-x^2}}.
\]

3. Find the derivative of \( f(x) = \ln\left(\frac{x^2(2x-7)}{(x-2)^4}\right) \). Simplify your answer by canceling like terms from the top and bottom of all fractions. (Hint: first simplify using logarithm laws.)

\[
\frac{d}{dx} \ln\left(\frac{x^2(2x-7)}{(x-2)^4}\right) = \frac{d}{dx} \left( \ln(x^2) + \ln(2x-7) - 4\ln(x-2) \right) \\
= \frac{2x}{x^2} + \frac{2}{2x-7} - 4 \frac{1}{x-2}.
\]