Math 2250 Exam #2 Practice Problems

1. Let $u(x) = \sqrt{f(x)}$ and suppose $f(3) = 1$, $f'(3) = 8$, and $f''(3) = -2$. What is the value of $u''(3)$?

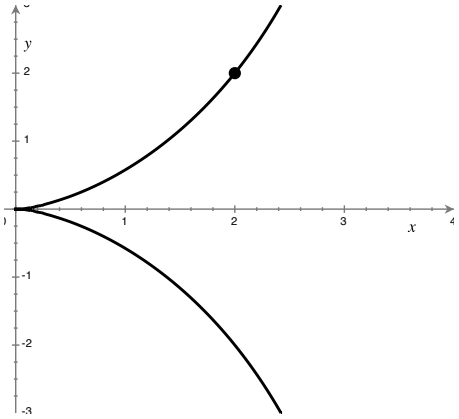
2. Let $f(x) = \frac{1}{2}\sin(x^2)\cos(x^2)$. What is $f'\left(\sqrt{\frac{5\pi}{6}}\right)$?

3. What is the tangent line to $x^3 + y^3 = 6xy$ at $(3, 3)$?

4. Suppose $y = x^{\arcsin(x)}$. What is $\frac{dy}{dx}$?

5. Use a linearization of an appropriate function to estimate $\ln(0.9)$.

6. The equation
$$(4 - x)y^2 = x^3,$$
determines a curve called a *cissoid*, pictured below. What is the equation of the tangent line to the cissoid at the point $(2, 2)$?



7. Consider the function
$$f(x) = \sqrt[5]{\sin x}.$$
At which values of x does the graph of f have a vertical tangent line?

8. Estimate $\tan(0.05)$ using an appropriate linearization.

9. A spherical balloon is inflated by an electric pump. To prevent strain on the material, you want to inflate the balloon in such a way that the surface area is increasing at a constant rate of 20 square feet per minute. At what rate (in cubic feet per minute) should air be pumped into the balloon when the radius of the balloon is 2 feet? (Remember that the volume of a sphere of radius r is $V = \frac{4}{3}\pi r^3$ and its surface area is $A = 4\pi r^2$.)

10. An asteroid hits the Atlantic Ocean and creates an expanding circular wave. If the area enclosed by this wave increases at the rate of 200 km^2/min, how fast is the *diameter* of the wave expanding when its *radius* is 20 km?

11. Find the equation of the tangent line to the graph of $2e^{xy} = x + y$ at the point $(0, 2)$.

12. At what x values does the graph of the function $f(x) = \tan(1 - x^2)$ have a horizontal tangent line?

13. Let $y = x^{\ln(x)}$. What is $\frac{dy}{dx}$?