Math113 Exam 2 Practice

1. let $f(x) = \sqrt{x^2 + 1}$. Use the definition of the derivative to compute f'(x).

2. Compute the area of the region between the graphs of $f(x) = x$ and $g(x) = \frac{x^3}{4}$ on the interval [-1,2].

3. Find the rectangle of largest area that can be inscribed in the unit circle.

4. Calculate $\frac{d}{dx}\sqrt{\sin\sqrt{x}}$ for $x > 0$.

5. Let $f(x) = \frac{x}{\sqrt{x^2+1}}$
a. Show that f^{-1} exists and find the domain and range of f^{-1}.
b. Evaluate $\int_0^2 f(x)\ dx$.

6. Suppose that f(x) is a continuous function defined for all x with the property that $|f(x_1) - f(x_2)| \le |x_1 - x_2|^2$
a. Write down a partition of the interval [a,b] into N subintervals of equal length(this is the regular partition).
b. Express $f(b) - f(a)$ as a telescoping sum using the partition.
c. Show that f(x) is constant using part b and the stated property of f.

7. Let $F(x) = \int_2^{x^2}(3t^2 + 1)^3\ dt$. Find $F(\sqrt{2}), F'(\sqrt{2}), F''(\sqrt{2})$.

8. Consider the integral $\int_0^1(1 - x)\ dx$ and let P be the regular partition of [0,1] into N equal subintervals.
a. Write down L(f,P) and U(f,P) ($f(x) = 1-x$) and explicitly evaluate them.
b. Use part a to evaluate the integral.