MATH 8 **Take Home Quiz #1** **Due: 07-01-13**

1. Given: $f(x) = 2x^3 + 3x + 2$.

a. Prove the $f(x)$ has an inverse function

b. Find $D_x\left[f^{-1}(x)\right]$

c. Find the slope of the tangent line to the graph of $f^{-1}(x)$ at the point with x-coordinate of 2.

2. Differentiate each of the following functions.

a. $y = e^{\sqrt{x^2 - x}}$

b. $f(x) = e^{\cos x}\sin x$

c. $y = \dfrac{e^{x^2}}{\ln x}$

d. $y = 2^{\tan x^2}$

e. $f(x) = \dfrac{\sqrt[3]{x^2 - 1}\left(x^3 + 1\right)^2}{\left(x^5\right)\left(e^{\sin x}\right)}$

f. $g(x) = x^3 \ln(x^2 - x)$

g. $y = x^{\sin x}$

h. $y = x^{x^x}$

i. $y = \log_2(x^2 - 1)$

j. $y = \arctan\left(x^2\right)\arcsin(x)$

3. Evaluate each of the following integrals.

a. $\int xe^{x^2}\,dx$

b. $\int \dfrac{e^{\sqrt{x}}}{\sqrt{x}}\,dx$

c. $\int \dfrac{\sin(\ln x)}{x}\,dx$

d. $\int \dfrac{x+1}{x^2 + 2x - 3}\,dx$

e. $\int \dfrac{\sec^2 x}{\tan x}\,dx$

f. $\int \dfrac{\sin x + \cos x}{\cos x}\,dx$

g. $\int \dfrac{1}{\sqrt{3e^{2x} - 4}}\,dx$

h. $\int \dfrac{\sin^{-1} x}{\sqrt{1 - x^2}}\,dx$

i. $\int \dfrac{e^x}{1 + e^{2x}}\,dx$

j. $\int \dfrac{1}{5 + 2x^2}\,dx$

k. $\int \dfrac{1}{x\sqrt{2x^2 - 5}}dx$

l. $\int \dfrac{1}{\sqrt{3 - 9x^2}}\,dx$

m. $\int e^x \sinh x\,dx$

n. $\int \coth x dx$

o. $\int x^4 e^{x^5}\,dx$

p. $\int \sec^5 x\,dx$

q. $\int \arcsin x\,dx$

r. $\int \cos\sqrt{x}\,dx$

s. $\int x\ln x\,dx$

t. $\int \arctan x\,dx$

4. Do the following problems form section 7.6 in the book: #6, #12; #14

5. Prove that $\cosh^2(x) + \sinh^2(x) \equiv \cosh(2x)$

6. Prove that $\cosh^2 x - \sinh^2 x \equiv 1$

7. Prove the derivative formula for:

a. $\sinh(x)$

b. $\cosh(x)$

c. $\tanh(x)$

d. $\operatorname{sech}(x)$

8. Prove the integration by parts formula/rule.

9. Using Calculus definition of natural log, prove $\ln\left(\dfrac{M}{N}\right) = \ln M - \ln N$.