Derivatives Extra Review

Directions: Do what it says. Don't use a calculator.

1. If f and g are inverses and $f(x) = e^{7x} + 3x$, find $g'(1)$ given that $f(0) = 1$.
2. If f and g are inverses and $f(x) = e^{5x} - x$, find $g'(1)$ given that $f(0) = 1$.
3. If f and g are inverses and $f(x) = \ln x - 3x$, find $g'(-3)$ given that $f(1) = -3$.
4. If f and g are inverses and $f(x) = 3e^{4x} - 2x$, find $g'(3)$ given that $f(0) = 3$.

5. Find the slope of the tangent line to $y = \sqrt{x^2 + 8}$ at $x = 1$
6. Find the slope of the tangent line to $y = e^{7x-6}$ at $x = 2$
7. Find the slope of the tangent line to $y = \ln(x^2 + 5x)$ at $x = 3$

8. Find the instantaneous rate of change of $y = (3x - 8)^6$ at $x = 2$.
9. Find the instantaneous rate of change of $y = \sqrt[3]{3x - 1}$ at $x = 3$.
10. Find the instantaneous rate of change of $y = \frac{2}{4x^2+5x}$ at $x = 1$.

11. Find the average rate of change of $y = x^3 + x + 5$ on $[0,2]$
12. Find the average rate of change of $y = \frac{2}{x^2-2}$on $[0,2]$
13. Find the average rate of change of $y = \sqrt{x + 2}$ on $[2,7]$

14. Find $\frac{d^2y}{dx^2}$ for $x^4 + 2y^3 = 2x^3 - y^2 + 4$
15. Find $\frac{d^2y}{dx^2}$ for $2 + 6x + 2y^5 = 3x^4 - y^2$
16. Find $\frac{d^2y}{dx^2}$ for $\sin x + 2x^2 + 2y^3 = 4x^4 - 3y^2 + 2$

17. Find $\frac{dy}{dx}$ for each of the following functions.

a. $y = \frac{\sin x}{\ln x}$

b. $y = 3^{x \tan x}$

c. $y = \tan^{-1}(x^3 - \cos x)$

d. $y = (\cos x)^{\ln x}$

e. $y = \sin(8x)\log_2(3x^2)$

f. $y = e^{x^2+\sin x}$

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

h. $y = \cos(7x^2 - 2x)$

i. $y = (\cos x)^{x^2+1}$

j. $y = \frac{1}{x^4 - \tan x}$

k. $y = \frac{4}{2-\sin^2 x}$

l. $y = \sqrt{(x^2-5)^3}$

m. $y = 2^{3x^2 \ln x}$

n. $y = \sqrt{\tan(x^3)}$

o. $y = x^{\tan^{-1} x}$

p. $y = \frac{4}{7}x^{\frac{8}{3}} - 2\sqrt[3]{x} + x^{\frac{2}{5}}$

q. $y = 3x^2 - 8x + 1$

r. $(5x^2 - \cos x)^{\pi}$

s. $(\tan x - \ln x)^{e+1}$

t. $y = \ln(\log_2 x)$

u. $xy + \ln y + x^2 = y - 5$

v. $\sin(xy) - x^2 + y^3 = x - 2$

w. $x \ln y - y \ln x = 1$

x. $x^3 y + \cos x - \sin y = e^x e^y$

y. $y = \sqrt{x^3 - \sqrt{x}}$

z. $x^y = y^x$