TAKE-HOME EXAM 2

Solve the following problems showing all your work for full credit.

1. (10 pts.) Using the definition, find the derivative of the following function.

$$f(x) = \frac{4}{\sqrt{x}}$$

2. (10 pts.) Find an equation for the tangent line to the graph of the given function at the specified point using the definition of derivative.

$$h(t) = t^2 + 3, \; (-2, 7)$$

3. (10 pts.) At time $t \geq 0$, the velocity of a body moving along the horizontal axis is $v = t^2 - 4t + 3$.

a) Find the body's acceleration each time the velocity is zero.

b) When is the body moving forward? Backward?

c) When is the body's velocity increasing? Decreasing?

4. Differentiate the functions.

a) (4 pts.) $f(x) = 2x^4 + 5\sec x - 3\cos x - x^{-4}$

b) (4 pts.) $f(x) = \dfrac{1}{x^3} + 4\sqrt[4]{x^3} + 4e^x + 5\ln x$

c) (6 pts.) $f(x) = 3x^{\frac{2}{3}} + 5x^{\frac{4}{5}} + \log_5 e^x + 2^{\sqrt{x}}$

d) (6 pts.) $f(x) = \sqrt{x} \csc 2x + \tan^{-1}(x^3)$

e) (6 pts.) $f(x) = \dfrac{x^3 + 3x + 2}{x^2 - 1}$

f) (3 pts.) $f(x) = \left(x^2 + 3x - 2\right)^3$

g) (5 pts.) $f(x) = \sqrt{x^3 - \sin 2x}$

h) (6 pts.) $f(x) = x^{-4} \tan\left(\sqrt{x}\right) + e^{\sin x}$

i) (6 pts.) $f(x) = \sin(\cos(2x^3 + 3x)))$

j) (6 pts.) $f(x) = \left(\dfrac{3x^2 - 2}{2x + 3}\right)^3$

5. (8 pts.) Find y' if $y^4 + 2x^2 y = x^3 - 2$.

6. (10 pts.) Use logarithmic differentiation to find the derivative of $y = \sqrt{\dfrac{(x+1)^9}{(2x+1)^5}}$.