MATH 104 HOUR 1a PRINT NAME _____

February 3, 2006 SIGNATURE _____

YOU MAY NOT SHARE CALCULATORS. SHOW ALL YOUR WORK.

(12) 1. Find $\frac{dy}{dx}$ (You need not simplify):

(a) $y = \dfrac{3x^2 - 5x}{x^2 - 6}$

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(b) $y = 5x^{\frac{5}{4}} - \dfrac{3}{x^2} + 74x - 11$

(12) 2. Let $h(x) = \dfrac{x+1}{3x-4}$ for $x \neq \frac{4}{3}$. Compute:

(a) $h(1 + h(1)) =$

(b) $h'(x) =$

(c) $h'(2) =$

(8) Write down an equation of a rational function (i.e., quotient of polynomials) which has vertical asymptotes at $x = 3$ and $x = 7$, and a horizontal asymptote at $y = -2$.

(8) 4. Find an equation of the tangent line to the graph of the curve $y = f(x) = 2x^3 - 2x^2 - 10$ at the point $(2, -2)$.

(10) 5. Let $y = f(x) = \begin{cases} \frac{3x^2-2x-1}{x-1} & \text{if } x \neq 1 \\ 5 & \text{if } x = 1 \end{cases}$

(a) Evaluate $\lim_{x \to 1} \dfrac{3x^2 - 2x - 1}{x - 1}$

(b) Is $f(x)$ a continuous function at $x = 1$? Why or why not?

(7) 6. Find the average rate of change of y with respect to x of the function $y = f(x) = x^2 + \dfrac{2}{x}$ on the interval $[1, 4]$.

(10) 7. Evaluate the limits:

(a) $\lim\limits_{\Delta x \to 0} \dfrac{(2x - \Delta x)^2 - 4x^2}{3\Delta x}$

(b) $\lim\limits_{x \to 16} \dfrac{x - 16}{4 - \sqrt{x}}$

(8) 8. Suppose that the supply equation for a certain commodity is $p = S(x) = 3 + .2x$ dollars and the demand equation is $p = D(x) = 38 - .3x$ dollars. Find the equilibrium point (x_0, p_0).

(9) 9. Find all points (x, y) at which the graph of $y = f(x) = \dfrac{x^2}{x+4}$ has a horizontal tangent line. Hint: First find $f'(x)$.

(16) 10. The total cost of producing x units of a certain product is $C(x) = 600 + 22x - .1x^2$ dollars.

(a) Find the marginal cost function.

(b) At what production level x does the marginal cost equal 16 dollars?

(c) Find the marginal cost when $x = 6$ units.

(d) Find the exact cost of the 7th unit.