Professor Katiraie Calculus I Spring 2008 Test III Form B (chapters 1 -- 3)

Name (☺ 1 Point)________________________________ Total Possible Points = 140
(Plus 10 pts Extra Credits ☺)

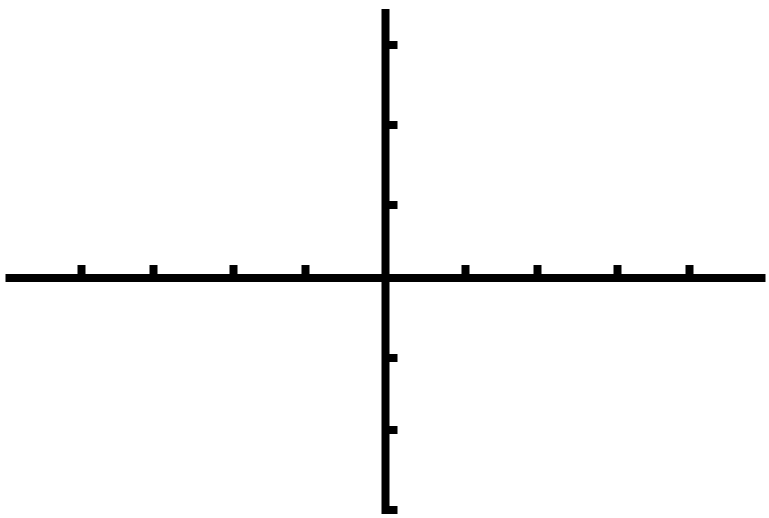
1) Given the following information about the limits, sketch a graph which could be the graph of y = $f(x)$. **Label all horizontal and vertical asymptote(s).** (10 Points)

$$\lim_{x\to\infty} f(x) = \lim_{x\to -\infty} f(x) = 3$$

$$\lim_{x\to -2^+} f(x) = \lim_{x\to 1^-} f(x) = -\infty$$

$$\lim_{x\to -2^-} f(x) = \lim_{x\to 1^+} f(x) = \infty$$

$$f(0) = -2$$



2) Given $f(x) = \sqrt{1+3x}$ (10 Points)

Find the $f'(x)$ using either of the two definitions discussed in class

(Must Use the Definition Of Derivative for Full Credits)

3) Find the inverse of the following functions. (10 points)
(Must Show All the Appropriate Steps)

a) $y = \sqrt[4]{x-2} - 5$	b) $f(x) = \frac{1}{4}\ln(7x)$

4) Given $f(x) = \begin{cases} 2x^3 + 7 & x \le -1 \\ x^2 + bx + c & -1 < x < 1 \\ x^4 - 10 & x \ge 1 \end{cases}$ determine the values for b and c so that $f(x)$ is continuous everywhere (10 points)

5) Find the derivative of the following functions: **(4 Points each)**

(Do Not Simplify)

a) $y = \sqrt[3]{x^7} + \dfrac{1}{\sqrt{x}}$	b) $y = e^{\sec(2\theta)}$
c) $y = \sin^5(4x)$	d) $y = \tan((5x)^3)$
e) $y = \sqrt{2x + \sqrt{3x}}$	f) $y = \left(\dfrac{-3x-7}{2x^2-1}\right)^7$
g) $y = 10^{\left[\sin(3\theta)+\cos(2\theta)\right]}$	h) $y = \sin(\sec(\sqrt{1+x^2}))$
i) $y = \sin^{-1}(x^2 + 2x + 1)$	j) $y = \ln(\dfrac{x^2}{2} + 2x + 1)$

6) Find the equation of the tangent line to the curve $2\sqrt{x}+4\sqrt{y}=14$
at the point (9 , 4). (10 Points)

7) Find the derivative of the function $y^{2x}=(3x)^{\cos x}$ (10 points)

Compute $y^{/}$ **in terms of** x**,** and y. **(Hint: Use Natural Logarithms)**

8) Suppose that $h(x)=g(x)f(x)$, and $F(x)=g(f(x))$, where
$$\begin{aligned} f(-3)&=4,\\ g(-3)&=2,\\ g^{/}(-3)&=-1,\\ f^{/}(-3)&=-3,\\ g^{/}(4)&=-5 \end{aligned}$$

a) Find $h^{/}(5)$ (5 Points)

b) Find $F^{/}(5)$. (5 Points)

9) Find all values of x so that the graph of $f(x)=\sqrt{3}\,x+2\sin x$ will have a horizontal tangent?

(5 Points)

10) Find the equation of the tangent line to the curve $y=x\cos x+x$, at the point $(\pi,0)$.

(5 Points)

11) A particle moves on a vertical line so that its coordinate at time t is

$$s(t)=t^3-12t^2+3 \quad t\geq 0$$

where S(t) is measured in meters and t is measured in seconds.

(10 Points)

a) When is the particle moving backward?

b) Find the distance that the particle travels in the time interval $5\leq t\leq 10$ seconds.

c) When is the particle slowing down?

12) Given $f(x) = -2e^{x}g(x) - 7x$

And $g(0) = 4$ and $f'(0) = -6$, find $g'(0)$.

(3 Points)

Prove that $\frac{d}{dx}(10\sec x) = 10\sec x\tan x$

(2 Points)

13) Find the linearization of $f(x) = \sqrt[3]{1+3x}$ at a = 0. (3 Points)

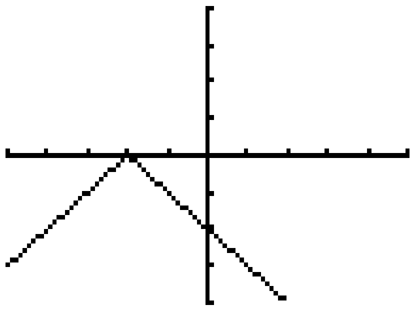
a) State the corresponding linear approximation.

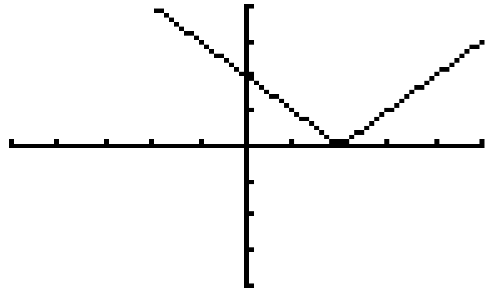
b) Use the above to give an approximate value for $\sqrt[3]{1.03}$ (2 Points)

Extra Credits

14) Given that $v(x) = \dfrac{f(x)}{g(x)}$, and $w(x) = f(x)g(x)$ (5 Points)

And graphs of f(x) and g(x)





Find the following:

$v^{/}(0)$	$w^{/}(-1)$

15) Given $x^3 + y^3 = 6xy^2$ **Find** $y^{/}$ **in terms of** x, and y.

(5 Points)