MAC 2311 Calculus 1 **Test 1** 31 Jan 2007 Name: _____

Show **ALL** work for credit; Give **EXACT** answers when possible; **Simplify** answers;

1. $\lim_{t\to 3} \dfrac{t^2-2t-3}{t^2-4t+3}$

2. $\lim_{h\to 0} \dfrac{2}{h}\left(\dfrac{5}{(x+h)^2}-\dfrac{5}{x^2}\right)$

3. $\lim_{x\to\infty} \dfrac{x^2-x-3x^3}{x^2-4x^3+3}$

4. $\lim_{h\to 0} \dfrac{x^2 h}{\sqrt{x+h}-\sqrt{x}}$

5. Let $D(t)$ be the U. S. National debt at time t, the table below gives approximate values of this function by providing end of year estimates, in billions of dollars. Estimate $D'(1990)$ and **INCLUDE UNITS** in your answer.

t	1980	1985	1990	1995	2000
$D(t)$	930	1945	3233	4974	5672

6. Find the hortizontal and vertical asymptotes of $h(x) = \dfrac{4x}{\sqrt{x^2+9}}$ (if none say none).

7. For the function $g(t)$ answer the true false questions below. (Use T or F)

$$g(t) = \begin{cases} 1-t & t < 1 \\ t^2 & 1 \le t < 2 \\ 5 & t = 2 \\ t^2 & 2 < t \le 3 \\ 3t & 3 < t \end{cases}$$

(a) $g(t)$ is continuous at 0. _____

(b) $g(t)$ is continuous at 1. _____

(c) $g(t)$ is continuous at 2. _____

(d) $g(t)$ is continuous at 3. _____

(e) $g(t)$ is right continuous at 1. _____

(f) $g(t)$ is left continuous at 1. _____

(g) $g(t)$ is right continuous at 3. _____

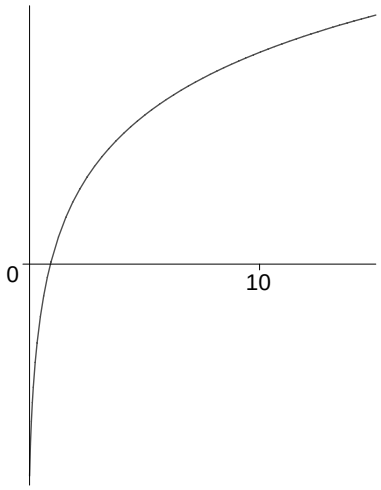
(h) $g(t)$ is left continuous at 3. _____

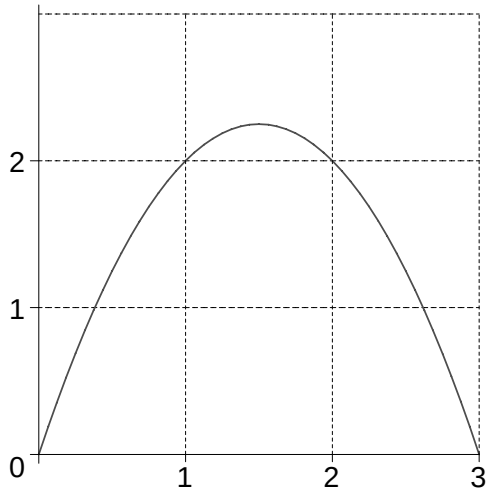
(i) $g(t)$ has a jump discontinuity at 2. _____

(j) $g(t)$ has a removable discontinuity at 2. _____

8. If $f(x)$ is the function the graph below left, list the following in increasing order:

$$0, \quad f'(10), \quad \frac{f(12)-f(10)}{2}, \quad f(11)-f(10)$$





9. If $g(x)$ is the function in graph to above right estimate $g'(1)$ and find the equation of the tangent line at $x = 1$

10. On the bottom graph draw the derivative of $f(x)$ the curve on the top graph. Be especially careful about the placement of the zero's of $f'(x)$.