Applied Calculus I
Practice Problems for Quiz # 6

1. Gasoline is pouring into a cylindrical tank of radius 3 feet. When the depth of the gasoline is 4 feet, the depth is increasing at 0.2 ft/sec. How fast is the volume of gasoline changing at that instant? (give units!)

2. A voltage V across a resistance R generates a current of $I = V/R$. If a constant voltage of 9 volts is put across a resistance that is increasing at a rate of 0.2 ohms per second when the resistance is 5 ohms, at what rate is the current changing? (give units!)

3. Compute $\lim_{t\to 0^+} \frac{1}{t} - \frac{1}{e^t-1}$.

4. Compute $\lim_{x\to 1} \frac{\ln x}{x^2-1}$

5. Compute $\lim_{t\to \pi} \frac{\sin^2 t}{t-\pi}$.

6. Which function dominates as $x \to \infty$: $f(x) = 0.01x^3$ or $g(x) = 50x^2$?

7. Find the global max and global min of the function $f(x) = 6x^3 + 18x^2 - 54x + 4$ over the interval $[-4, 4]$. Also determine all local mins and local max's on that interval. Determine on which intervals of $(-\infty, \infty)$ the function is increasing/decreasing. Also, determine on which intervals the function is concave up/up and identify any points of inflection. Show your work!

8. Find the global max and global min of the function $f(x) = x/(x^2 + 1)$ over the interval $[-0.5, 4]$. Also determine all local mins and local max's on that interval. Determine on which intervals of $(-\infty, \infty)$ the function is increasing/decreasing. Also, determine on which intervals the function is concave up/up and identify any points of inflection. Show your work!

9. Find the global max and global min of the function $f(x) = x^7(x + 5)^6$ over the interval $[-11, 12]$. Also determine all local mins and local max's on that interval. Determine on which intervals of $(-\infty, \infty)$ the function is increasing/decreasing. Also, determine on which intervals the function is concave up/up and identify any points of inflection. Show your work!

10. Find the point on the line $-7x + 6y + 4 = 0$ that is closest to the point (2,2).

11. A rectangle has one side on the x-axis and two vertices on the curve $y = 1/(1 + x^2)$. Find the vertices of the rectangle with maximum area.

12. If you have 100 feet of fencing and want to enclose a rectangular area up against a long, straight wall, what is the largest area you can enclose?

13. A cylinder is inscribed in a right circular cone of height 2 and radius (at the base) equal to 4. Find the dimensions of such a cylinder that has maximum volume.