1. Evaluate the limit . . . . (a)

$$\lim_{x\to 0^+} \frac{2x^4 - 8x^2}{x^4 + 4x^2}$$

(b)

$$\lim_{x\to 0} \frac{\sin x - x}{x^3}$$

2. Find the point on the line $y = \sqrt{x+1}$ that is closest to the point $(8, 0)$.

3. Consider the region bound by $y = 1$, $x = 0$ and $y = \sqrt{x}$. Find the volume of the solid of revolution when the region is revolved about the:

x-axis

4. Revolve the region above about the **y-axis** and compute the volume of the resulting solid.

5. Suppose the volume of a spherical balloon increases at a rate of $24\frac{cm^3}{sec}$. Find the rate that its diameter is increasing when the diameter is $3cm$.

6. Find the absolute maximum and absolute minimum of the function on the indicated interval.

$$f(x) = \frac{x^4}{4} - 2x^2 + 1, \ \ [-3, 1]$$

7. A gardener is planning to build a rectangular fence which encloses 28 ft^2. One of the sides is to be made of stone which costs $10\frac{\$}{ft}$, and the remaining sides are to be made of wood which costs $4\frac{\$}{ft}$.

(a) What dimensions minimize the cost of such a fence?

(b) What is the mimimum cost?

8. A boat leaves Marquette at 3:00 PM and travels due north at a speed of 10 m/h. Another boat has been heading west at 15 m/h and reaches Marquette at 5:00 PM. At what time were the boats closest together?

9. A fence 7 feet tall runs parallel to a tall building at a distance of 6 feet from the building. What is the length of the shortest ladder that will reach from the ground over the fence to the wall of the building?

10. A box with an open top is to be constructed from a square piece of cardboard, 6 ft wide, by cutting out a square from each of the four corners and bending up the sides. Find the largest volume that such a box can have.

11. Find the equation of the tangent line to the graph of $y = (x^2 + 1)\sin x$ at $x = 0$.