1. Practice Midterm 2

Problem 1. A particle moves in such a way that its distance from the origin at time t is given by $s(t) = 2\sqrt{t^2+4}$. If $v(t)$ is the velocity of the particle at time t, what is

$$lim_{t\to\infty} v(t)?$$

(a) 2 (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{\sqrt{2}}$ (e) 0 (f) ∞

Problem 2. What are the global maximum and minimum values of the function

$$f(x) = \frac{x}{1+x^2}?$$

(a) 2 and -2 (b) 1 and -1 (c) 1/2 and -1/2

(d) 2 and 0 (e) 4 and -4 (f) 1 and -1

Problem 3. A stock market analyst sold a monthly newsletter to 320 subscribers at a price of \$10 each. She discovered that for each \$0.25 increase in the monthly price of the newsletter, she would lose 2 subscriptions. If she sets the price of the newsletters to bring in the greatest total monthly income, what will that income be?

(a) \$3200 (b) \$4400 (c) \$5000

(d) \$5800 (e) \$6500 (f) \$7200

Problem 4. The curve

$$y = x^3 + 3x^2 + ax + b$$

has one inflection point. The tangent line at this inflection point is $y = 3x + 4$. Find the constants a and b.

Problem 5. A right circular cylinder is inscribed in a cone with height 1 meter and base radius 1 meter. What is the largest possible volume of such a cylinder?

Problem 6. A particle moving on the real line has an acceleration function of $a(t) = cos(t) + sin(t)$. If the particle is at the orgin when $t = 0$ and has a velocity of 5 when $t = 0$, what is the position function for the particle?

Problem 7. Let $f(x) = \frac{x^2-4}{x^2+4}$

Find the x-intercepts and y-intercepts of $f(x)$.

Find the intervals of increase and decrease of $f(x)$.

Find the local maxima and local minima of $f(x)$.

Find the intervals of concavity of $f(x)$.

Find the inflection points of $f(x)$.

Find the horizontal, vertical and slant asymptotes of $f(x)$.

Use all of the above information to **carefully** graph $f(x)$.

Problem 8. Find the value of c (if any) that satisfies the conclusion of the Mean Value Theorem for the function $f(x) = \frac{1}{1+x}$ on the interval [0,1] .

a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{\sqrt{2}}{2}$

(d) $2 - \sqrt{2}$ (e) $\sqrt{2} - 1$ (f) no values