1.Find $dy/dx$ for the following: $x^2 - xy + y^3 = 8$, $\sqrt{x+y} + \sqrt{xy} = 8$, $x\sqrt{1+y} + y\sqrt{1+2x} = 2x$ Explain how to find where the tangents are horizontal and vertical (these may require solving a difficult equation; you will not be required to solve the difficult ones on this test, but possibly on the final)?

2. Find the tangent line to $y^2 = x^3(2-x)$ at $(1,1)$, $2\left(x^2+y^2\right)^2 = 20\left(x^2+y^2\right)$ at $(3,1)$

3. Find the following limits:

$$\lim_{x\to 0} \frac{1-\cos 2x}{x^2}$$
$$\lim_{x\to \infty} \frac{\ln x}{x}$$
$$\lim_{x\to 0^+} \frac{x}{\ln x}$$
$$\lim_{x\to \infty} \frac{\ln(\ln x)}{\sqrt{x}}$$
$$\lim_{x\to \infty} x^2 e^{-x}$$
$$\lim_{x\to 0} \frac{x\sin x}{x^2+1-\cos x}$$
$$\lim_{x\to 0} \frac{\cos x}{x}$$
$$\lim_{x\to 0} \frac{\sin(ax)}{x}$$
$$\lim_{x\to 0} \frac{\sinh x}{x}$$
$$\lim_{t\to 0} \frac{\cosh t^2 - 1}{t^4}$$

4. Give the following lines in slope/intercept form:

$$x = 3+4t,\ y = 2+8t$$
$$x = -2 + \frac{3}{4}t,\ y = 2t$$

5. Give a parametrization of the circle of radius 4 centered at the origin which starts at (-4,0) and moves clockwise. Sketch graphs of $x$ vs $t$ and $y$ vs $t$ for a parametrization of a rectangle whose vertices are (0,0), (-3, 0), (-3, -1), (0, -1) which starts at (0,0) and moves counterclockwise.

6. Chapter 4 Check your understanding: 1,2,3,5,6,7,8,9,10,11,16,14,18

7. Chapter 4 Review: 1,2,3,5,6,15,20, 23, 27,28,29,33, 37a

8. a. Find two numbers whose sum is 100 and whose product is a maximum

b. Find the points on the hyperbola $y^2 - x^2 = 4$ that are closest to the point $(2,0)$.

c. If 1200 $\text{cm}^2$ of material is available to make a box with a square base and open top, find the largest possible volume.

d. A farmer with 750 ft of fencing wants to enclose a rectangular area and then divide it into 4 pens with fencing parallel to one side of the rectangle. What is the largest possible total area of the 4 pens.

9. Find the best possible bounds for the following: $e^{-x^2}$ on $[-1,1]$, $\sin 4x$ on $[-\pi/2, \pi/6]$, $Ae^{-x} + Be^x$ for $A > 0$ and $B > 0$.