Fall 98 **Math 120 Exam 1** Prof. Brick

Do the problems in order in your bluebook. Show your work.

1. Use a tangent line of $\sqrt{x}$ to approximate $\sqrt{9.1}$. Draw a graph that illustrates things.

2. Find the equation of the line tangent to $f(x) = (x^2 + 2)^2$ at $x = 1$.

3. Suppose $y' > 0$ for $x < 5$ and $y' < 0$ for $5 < x$. What sort of point does the graph of y have at $x = 5$? Explain.

4. For what x is the tangent line of $y = x^3 - 3x$ horizontal ? Don't use your grapher here.

5. A ball is thrown up from a window. Its height is $s(t) = 96 + 16t - 16t^2$ feet t seconds later. At what time and at what velocity does it hit the ground ?

6. Find the derivative of $y = \sqrt[7]{x^2} - \pi x^7 + 7\pi^3 + \dfrac{7}{x^7 + 1}$

7. For what x is $y = x^3 - x^2$ concave up ? Find all such x. Don't use your grapher here.

Fall 98 **Math 120 Exam 2** Prof. Brick

Do the problems in order in your bluebook. Use algebraic techniques.

1. Design a rectangular garden placed up against a wall that uses 200 feet of fencing and encloses as much area as possible.

2. Find the absolute min/max's of $y = \frac{1}{9}x + (1/x)$ over $[2, 5]$

3. A bookstore sells 8000 copies of "The Joy of Calculus" each year. The order fee is \$40. The carrying costs are \$2 per book per year. How often should orders be placed ?

4. Use the second derivative test to classify the the local min/max's of $y = \frac{1}{3}x^3 - 2x^2 - 5x$.

5. You have a sample of the radioactive element Calculusium. At noon you have 63 grams. At 2:45 pm you have 40 grams. Find its half-life.

6. You wish to sell Calculus T-shirts to raise money for a math party. A market survey indicates that if you charge \$20 a shirt, you will sell 60 each week, while each dollar increase will result in four fewer sales. Find the price that maximizes revenue.

7. Find where $f(x) = \ln(x^2 + 1)$ is concave up or down and find its inflection points.

8. Find the first derivative of $g(x) = \left(4x^6 + e^{x^2} + \sqrt{x}\right) \cdot \left(5x^2 + \pi^2 - e^{\pi}\right)$

Fall 98 **Math 120 Exam 3** Prof. Brick

Do the problems in order in your bluebook. Use algebraic techniques.

1. Find a function with $y' = 3x^2 + \frac{2}{3}\sqrt{x}$ and $y(1) = 77$

2. Using 4 rectangles and the right-hand rule, give a sum that approximates the area under $y = e^{-x^2}$ from $x = 0$ to $x = 2$. Sketch a graph showing the rectangles. Don't bother adding up the sum.

3. Find the average value of $y = x^2$ over $[0, 2]$. Indicate the geometric significance of the average value. Sketch a graph.

4. Find the volume obtained by rotating the region under $y = x + 1$ from $x = 1$ to $x = 2$ about the x-axis.

5. Find the integral $\int_1^3 (1/x)\, dx$. This is the area of what region ? Sketch a graph.

6. Find $\int (x^3 - e^{5x} + 4)\, dx$

7. Find the monthly payments on a 30 year $ 68,000 mortgage with annual interest 7.25%. Show the formula you use.

Fall 98 **Math 120 Final Exam** Prof. Brick

Do the problems in order in your bluebook. Use algebraic techniques.

1. A ball is thrown up from a window. Its height after t seconds is $s(t) = 96 + 16t - 16t^2$. At what velocity does it hit the ground ?

2. Find the tangent line to $h(x) = \dfrac{x+1}{x^2+3}$ at $x = 1$

3. Use the second derivative test to classify the the local min/max's of $y = x^3 - 6x^2$.

4. The cost of producing x units is $C(x) = 1000 + xe^{.3x}$. Find the marginal cost.

5. The population of Calculusville was $120,000$ in 1950 and $200,000$ in 1980. Using an exponential model, predict the population in the year 2000.

6. How long before money at 7.5% annual interest compounded monthly doubles ?

7. Design a rectangular garden placed up against a long wall that uses 400 feet of fencing and encloses as much area as possible.

8. You wish to sell espresso during lunchtime. A market survey indicates that if you charge \$1 a cup, you will sell 44 cups an hour while each dime increase will result in four fewer sales. Find the price that maximizes revenue.

9. Find a function $y = f(x)$ for which $y' = 3x^2 - 2x$ and $y(1) = 0$.

10. Find the area of the region bounded by $y = x^2$ and $y = x$.