## MATH 115 - SEC 011, WINTER 2011. QUIZ 7
TIME LIMIT: 20 MINUTES

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Good luck!

Problem 1. In Modern Portfolio Theory, a clients portfolio is structured in a way that balances risk and return. For a certain type of portfolio, the risk, x, and return, y, are related by the equation $x - 0.45(y-2)^2 = 2.2$. This curve is shown in the graph below. The point P represents a particular portfolio of this type with a risk of 3.8 units. The tangent line, l, through point P is also shown.

y, Return (% per year)

l

P

x−0.45(y−2)^2=2.2

x, Risk
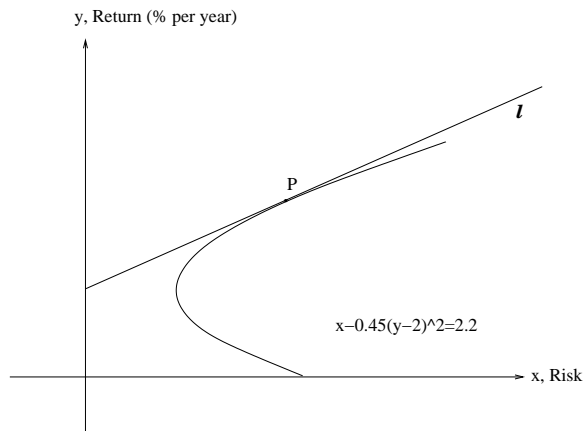
(a) Using implicit differentiation, find $\frac{dy}{dx}$, and the coordinates of the point(s) where the slope is undefined.

(b) The y-intercept of the tangent line for a given portfolio is called the Risk Free Rate of Return. Use your answer from (a) to find the Risk Free Rate of Return for this portfolio

(c) Now, estimate the return of an optimal portfolio having a risk of 4 units by using your information from part (b). Would this be an overestimate or an underestimate? Why?

Problem 3.

(1) Explain why the following equation has a solution near 0:

$$e^t = 0.2t + 1.098$$

(2) Replace e^t by its linearization near 0. Solve the new equation to get an approximate solution to the original equation.

Problem 2.

(i) Graph $f(x) = x^3 - 3x^2 + 3x + 1$

(ii) Find and add to your sketch the local linearization of $f(x)$ at $x = 2$.

(iii) Compute and mark on your on sketch the true value of $f(1.5)$, the tangent line approximation to $f(1.5)$ and the error in the approximation.