MATH 220 Exam 4 Review

1. Evaluate the following integral expressions.

$$\int \sqrt{x}\ln x\, dx$$

$$\int \frac{x}{\sqrt{x^2+1}}\, dx$$

$$\int \frac{x^2+x-2}{x}\, dx$$

$$\int_1^3 (3x^2+x-7)\, dx$$

$$\int_{-2}^1 \frac{3}{x-2}\, dx$$

$$\int (2x+\sqrt[3]{x}-7)\, dx$$

$$\int_1^2 \frac{(\ln x)^2}{x}\, dx$$

$$\int_{-1}^{-5} (x-5)\left(\frac{1}{x}+3\right) dx$$

$$\int e^{3x}(x-3)\, dx$$

$$\int \frac{6x^2+10}{x^3+5x}\, dx$$

$$\int_0^1 \frac{x^2-x-2}{x+1}\, dx$$

$$\int \frac{3x^4+x+x^{-3}}{x^2}\, dx$$

$$\int (2x^3+3x)(x^4+3x^2)^8\, dx$$

$$\int_0^1 \frac{7x^3}{x^4+1}\, dx$$

$$\int xe^{-3x}\, dx$$

$$\int 3x^3(x^2+1)^5\, dx$$

2. The price of a new iPhone over its first five years on the market is given by the function $P(t) = -4t^3 + 20t + 400$. What is the average price of this iPhone over its first five years in existence?

3. Suppose you have an account that compounds interest continuously at a rate of 10%. For the next 15 years, money continuously flows into your account at a rate of $4t + 1$ dollars per year. How much money will be in the account at the end of 15 years?

4. Grandpa has set up a trust fund to help pay for his 3-year old grandson's eventual college education. He plans to add money continuously to the fund at a rate of $5000 per year, and the fund earns interest at a rate of 6% compounded continuously.

a) How much money will be in the trust fund in 15 years? You don't need to simplify your answer.

b) Suppose Grandpa decides to invest a single amount today instead of spreading the investment out over 15 years. How much will need to be invested today in order to have the same amount in 15 years as the investment in part a)?

5. Find the area of the region enclosed by $f(x) = x^2 - 4x + 12$ and $g(x) = -x^2 + 4x + 6$ over the interval $[-2, 3]$.

6. The value of an investment fund has changed at the rate of $\frac{dV}{dt} = 3\sqrt{t}$ dollars/year, where t represents the number of years since the fund began.

a) One year after the fund began, Bob bought one share of the fund for $20.00. How much was his share worth when he sold it eight years after he bought it. Simplify your answer as much as possible.

b) What was the average value of one share of the fund during the time that Bob held his share? Your answer should be numeric (containing no variables or calculus symbols), but you do not have to simplify the arithmetic.

7. Megan has inherited some money from her great-grandmother. For the next ten years, $4000 per year will flow at a constant rate into a special account. The account earns an annual interest of 8%, compounded continuously. How much *interest* will Megan earn from the account during the first six months? Your answer should be numeric (containing no variables or calculus symbols), but you do not have to simplify the arithmetic.

8. Find f such that $f(1) = 4$ and $f'(x) = 2x + \frac{1}{\sqrt{x}} + 3$

9. Find the area between the x-axis and the graph of $f(x) = 3x^2 - 12$ on $[1, 4]$. (Find the ACTUAL area, not the SIGNED area.)

10. An investment of $15000 is made. It grows with continuous compounding at a 7% rate per year for 14 years. What is its value at the end of that time?

11. An investment is made as a continuous money flow of $5000 per year of 7 years. Interest of 8% per year is compounded continuously. What is the present value of the investment?

12. An investment of $1000 is made. Interest is compounded quarterly with an annual interest rate of 5%. How long will it take for the money to triple?

13. Suppose marginal revenue is given by the expression $R'(p) = 500 - \frac{3}{5}p^2$, where $0 \leq p \leq 50$.

a) Find $\int_{30}^{40} R'(p) \, dp$. Simplify your answer as much as possible.

b) Using correct units, give a full interpretation of the meaning of your answer from part a).