Calculus II Final Exam

Please show your work on all problems.

1. Find the area enclosed by the curves $y = x^2$ and $y = 4x - x^2$.

2. Consider the region bound by the curves $y = e^{-x}$, y = 0, x = 1, and x = 10. Find the volume of the solid obtained by rotating this region about the *x*-axis using the disk method.

3. An aquarium has a 2 ft by 1 ft rectangular base, and it is 1 ft tall. If it is full of water, how much work is required to pump all of the water out of the aquarium (water weighs 62.5 lb/ft³)?

4. Find $\int x^2 e^x dx$ without using a calculator.

5. Does the series
$$\sum_{n=0}^{\infty} \frac{1}{8^n}$$
 converge? Justify your answer.

6. Does the series $\sum_{n=1}^{\infty} \frac{4n+5}{7n+2}$ converge? Justify your answer.

7. Find the arc length of the curve $y = \cos x$, $0 \le x \le \frac{\pi}{2}$.

8. Find the area of the surface obtained by rotating the curve $y = \sqrt{100 - x^2}$, $-10 \le x \le 10$, about the *x*-axis.

9. Consider the parametric curve $x = 5t^3 + 7t + 1$, $y = 7t^2 + 9t + 6$, $0 \le t \le 5$. Find the slope of the tangent line to this curve at t = 4.

10. Find
$$\int \frac{5x-1}{x^2+x-12} dx$$
 without using a calculator.

11. Evaluate $\int_0^1 x^3 \sqrt{1-x^2} \, dx$ without using a calculator.

12. Find the radius and interval of convergence for the power series $\sum_{n=1}^{\infty} \frac{(x-5)^n}{n}$.