Exam 3
Chapters 5 and 6

Answer the following questions. *You must show your work to receive full credit.* Be sure to make reasonable simplifications. Indicate your final answer with a $\boxed{\text{box}}$.

1. (5 points) Explain in words what the definite integral of a function represents and how we approximate it.

2 (5 points) A spaceship is traveling through space at a rate of $f(t) = t^2 + 17$ light years per minute for $0 \leq t \leq 4$ where t is measured in minutes. Use a right Riemann sum with $n = 2$ subintervals to approximate the the total distance that the ship covers. Make sure to give units.

3. (5 points) Consider the graph below. Represent the indicated area as a definite integral.

4. (10 points) Water is leaking from your city pool at a rate of $g(t) = \frac{5}{t} - \frac{3}{t^2}$ gallons per minute, where t is in minutes. How much water leaks from the pool in the second hour?

5. (5 points) Use the graph of the function $f(x) = 2x + 2$ to evaluate $\int_0^1 0f(x)dx$.

6. (6 points) Find the antiderivative $F(x)$ of the function $f(x) = 3x^2 + e^x$ which satisfies $F(0) = 2$.

7. (3 points each) Consider the graph of $h(x)$ below. Determine if each of the following is positive, negative or zero.

$$(a) \quad \int_{-6}^{0} h(x)dx \qquad (b) \int_{-2}^{2} h(x)dx \qquad (c) \int_{-6}^{4} h(x)dx$$

8. (10 points) The derivative $f'(x)$ is graphed below. Fill in the table of values for $f(x)$ given that $f(0) = 10$.

9. (4 points) Find the derivative of the function $g(x) = \ln(t^3 + 1)$. Make sure you show work and mention which rule your are using to solve this. (Hint: See next problem)

10. (6 points) Evaluate $\int_0^{10} \frac{3t^2}{t^3+1} dt$.

11. (5 points) Find the indefinite integral $\int (3x^9 + e^{2x} - \frac{3}{x}) dx$.

Bonus Question. Draw a picture.