

Instructions: This homework is an individual effort. Answer each question. This is due on **Monday, April 13th. Show all work to receive full credit.**

1. Evaluate the following indefinite integrals:

a. $\int e^x dx$

Solution 1. $\int e^x dx = e^x + C$

b. $\int x^7 dx$

Solution 2. $\int x^7 dx = \frac{x^8}{8} + C$

c. $\int 5x^4 dx$

Solution 3. $\int 5x^4 dx = x^5 + C$

d. $\int \frac{1}{2x} dx$

Solution 4. $\int \frac{1}{2x} dx = \frac{\ln|x|}{2} + C$

e. $\int 2\pi r dr$

Solution 5. $\int 2\pi r dr = \pi r^2 + C$

f. $\int (3x^2 + 4x + 5) dx$

Solution 6. $\int (3x^2 + 4x + 5) dx = x^3 + 2x^2 + 5x + C$

g. $\int \frac{3}{\sqrt{x^3}} dx$

Solution 7. $\int \frac{3}{\sqrt{x^3}} dx = \int 3x^{-3/2} dx = \frac{-6}{\sqrt{x}} + C$

2. Evaluate the following definite integrals. SHOW ALL WORK

a. $\int_1^2 (3x^2 + 2x + 1) dx$

Solution 8. $\int_1^2 (3x^2 + 2x + 1) dx = x^3 + x^2 + x \Big|_1^2 = (2^3 + 2^2 + 2) - (1 + 1 + 1) = 11$

b. $\int_{-1}^1 (-x^2) dx$

Solution 9. $\int_{-1}^1 (-x^2) dx = \left. \frac{-x^3}{3} \right|_{-1}^1 = \frac{-1}{3} - \left(\frac{1}{3} \right) = -\frac{2}{3}$

c. $\int_{-3}^3 x^3 dx$

Solution 10. $\int_{-3}^3 x^3 dx = \frac{x^4}{4} \Big|_{-3}^3 = 3^4 - (-3)^4 = 0$

d. $\int_1^3 \left(\frac{1}{x} + e^x\right) dx$

Solution 11. $\int_1^3 \left(\frac{1}{x} + e^x\right) dx = \ln|x| + e^x \Big|_1^3 = \ln(3) + e^3 - (\ln(1) + e^1) = \ln(3) + e^3 - 1 - e$

3. Water is pumped out of a holding tank at a rate of $5 - 5e^{-0.12t}$ liters per minute, where t is the number of minutes since the pump started. Find the amount of water pumped out after 1 hour.

Solution 12. $\int_0^{60} 5 - 5e^{-.12t} dt = 5t + \frac{5e^{-.12t}}{-.12} \Big|_0^{60} = 5t + \frac{500e^{-.12t}}{12} \Big|_0^{60} = \frac{e^{-7.2}}{12} - \frac{500}{12}$ liters