Problem 1. Find the following indefinite integrals.

(1) $\int \left(5x^4 - x^3 + 6x - 2\right)\, dx$

(2) $\int \left(\sqrt{u} + \frac{1}{\sqrt{u}}\right)\, du$

(3) $\int \left(2e^x + \frac{1}{5x} + \frac{4}{x^3}\right)\, dx$

(4) $\int \left(5\sqrt{x^3} + 6x^{-1}\right)\, dx$

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

(6) $\int \left(\dfrac{4x^3 + x\sqrt{x} + 5x^2}{8x}\right)\, dx$

Problem 2. If $y' = \dfrac{3}{x} + \dfrac{1}{x^2}$ and $y(1) = 1$, what is y?

Problem 3. What is the most general antiderivative of $f(x) = 3\sqrt{x} - \dfrac{1}{x^2} - x^{3/2}$?

Problem 4. Rewrite the integral $\displaystyle\int (x+4)e^{3x^2+24x}\,dx$ in terms of u after an appropriate u-substitution.

Problem 5. Find the following indefinite integrals using the appropriate u-substitution.

(1) $\displaystyle\int 7\ (8x+3)^{10}\ dx$

(2) $\displaystyle\int 2x^2\ \sqrt[4]{x^3+2}\ dx$

(3) $\displaystyle\int \frac{3(x^3+1)}{(3x^4+12x)^7}\ dx$

(4) $\displaystyle\int \frac{12x}{3x^2+5}\,dx$

(5) $\displaystyle\int x^6\ e^{x^7-1}\,dx$

(6) $\displaystyle\int \frac{e^x-e^{-x}}{e^x+e^{-x}}\,dx$

(7) $\displaystyle\int \frac{e^{1/x}}{x^2}\, dx$

(8) $\displaystyle\int \frac{\ln(5x)}{2x}\, dx$

(9) $\displaystyle\int \frac{1}{2x\ln(5x)}\, dx$

Problem 6. Yearly sales of a particular item are expected to decrease at a rate of $s(t) = -24t^{2/3}$ items per year, where t is time, in years. If yearly sales now are 1800 items, find a function $S(t)$, which will represent the number of items sold each year.

Problem 7. The marginal revenue function for a company that sells barbecue grills is given by $R'(x) = -0.08x + 350$ dollars per grill sold. Find the company's revenue function, in dollars, when x grills are sold.

Problem 8. If the marginal cost function for a company is given by $f(x) = 0.12e^{0.04x}$ dollars per item, and if the company has fixed costs of \$3000, where x represesnts the number of items produced, find the company's total cost when 150 items are produced.