Worksheet 10

Problem 1. Evaluate the following definite integrals.

a) $\displaystyle\int_1^5 2\,dx$

b) $\displaystyle\int_{-2}^2 (4x+3)\,dx$

c) $\displaystyle\int_1^4 \frac{3}{(3x+2)^2}\,dx$

d) $\displaystyle\int_{-1}^0 x^5(9x^6-7)^3\,dx$

e) $\displaystyle\int_1^3 \frac{\sqrt{\ln x}}{x}\,dx$

f) $\displaystyle\int_0^1 \frac{e^{2x}}{\sqrt{1+e^{2x}}}\,dx$

Problem 2. Scientists find that a particular tree grows at the rate of $0.6 + 4/(t+1)^3$ ft per year, where t is the time in years. How many feet does the tree grow during the third year?

Problem 3. Use the definite integral to calculate the area between the x-axis and the curve $y = e^x - 1$ on the interval $[-1, 2]$. (Make sure you remember to check for points where the curve crosses the x-axis!)

Problem 4. Suppose
$$f(x) = \begin{cases} 2x+3 & \text{if } x \le 0 \\ -\dfrac{x}{4}+3 & \text{if } x > 0. \end{cases}$$

Sketch a graph of this function on the interval $[-1, 4]$, and then calculate $\displaystyle\int_{-1}^4 f(x)\,dx$.

Problem 5. You are told that $\displaystyle\int_0^1 e^{x^2}\,dx \approx 1.5$ and $\displaystyle\int_0^2 e^{x^2}\,dx \approx 16.5$. Use this information to approximate the following.

a) $\displaystyle\int_{-1}^1 e^{x^2}\,dx$.

b) $\displaystyle\int_1^2 e^{x^2}\,dx$.

Problem 6. Evaluate $\displaystyle\int_{-5}^5 x(x^2+3)^7\,dx$ without finding an antiderivative.