1. Find each of the following indefinite integrals. Check your answers by differentiation.

   (a) $\int 4^x \, dx$

   (b) $\int (5^x + x^5 + 5^5) \, dx$

(c) $\displaystyle\int \left(3y^2 + \frac{3}{y^2} + 3\sqrt{y} + \frac{3}{\sqrt{y}}\right) dy$

(d) $\displaystyle\int (12\sin(x) + \sin(12x) + x\sin(12))\, dx$

2. Find each of the following definite integrals:

   (a) $\displaystyle\int_0^1 (e^{u/3} + 2)\, du$

   (b) $\displaystyle\int_{-1}^1 \frac{1}{1+x^2}\, dx$ (Here, you may wish to recall that $\tan(-\pi/4) = -1$ and $\tan(\pi/4) = 1$.)

3. Solve the initial value problem

$$F'(x) = 2 - x + \cos(x), \quad F(0) = -2.$$

4. Find the area under the graph of $f(x) = 2 - x + \cos(x)$ from $x = 0$ to $x = \pi/2$.