1. (7 pts) Evaluate \( \int \frac{1}{3 - 4x - x^2} \, dx \)

   Complete the square: \(-[x^2 + 4x] + 3 = -(x^2 + 4x + 4 - 4) + 3 = -(x + 2)^2 + 7\). The integral becomes \( \int \frac{1}{7 - (x + 2)^2} \, dx = \frac{1}{7} \int \frac{1}{1 - (x + 2)^2/7} \, dx = \frac{1}{7} \int \frac{1}{1 - u^2} (\sqrt{7} du) \) with 
   \( u = (x + 2)/\sqrt{7} \) and \( du = dx/\sqrt{7} \). Hence the antiderivative is \( \frac{\sqrt{7}}{7} \tanh^{-1} \left( \frac{x + 2}{\sqrt{7}} \right) + c \).

2. (7 pts) Evaluate \( \lim_{x \to \infty} xe^{1/x} - x \). Be sure to show your work.

   The form is \( \infty - \infty \), so rewrite it as \( x(e^{1/x} - 1) \), which gives the form \( \infty \cdot (1 - 1) \). Force the fraction to get \( \lim_{x \to \infty} e^{1/x} - 1 \). Use L’H to get \( \lim_{x \to \infty} e^{1/x} - 1 = 0 \).

3. (6 pts) Evaluate \( \int x^5 \ln x \, dx \)

   Let \( u = \ln x \) so we differentiate it rather than integrating it. Then \( dv = x^5 \, dx \), \( du = (1/x) dx \) and \( v = x^6/6 \). The integral is then equal to \( x^6 \ln x/6 - \int x^6/6 \, dx = x^6 \ln x - x^6 \frac{1}{6} + c = \frac{x^6 \ln x}{6} - \frac{x^6}{36} + c \).