SECTION 4.10 ANTIDERIVATIVES

- (families of) antiderivatives
- indefinite integrals
- initial value problems

1. Find the (family of) antiderivatives for the following.

   (a) $f(x) = 4x^3$ (b) $f(x) = 5\sin(x)$ (c) $f(x) = \frac{e^x}{4}$

   (d) $f(x) = \sqrt{2}$ (e) $f(x) = \frac{1}{x}$ (f) $f(x) = 1 - x + e^x$

2. Is $F(x) = x + xe^x$ is an antiderivative of $f(x) = (x+1)e^x + 1$? Show your answer is correct.

Function	Antiderivative
x^k $(k \neq -1)$	
x^{-1} for all x	
1	
$\sin(x)$	
$\cos(x)$	

Function	Antiderivative
e^x	
$1/(1+x^2)$	
$\sec^2(x)$	
$\sec(x)\tan(x)$	
$1/\sqrt{1-x^2}$	

3. Evaluate the integrals.

   (a) $\int (x^{1/2} + x^{-7/4}\, dx$

   (b) $\int (8e^x + \sec^2(x))\, dx$

   (c) $\int \frac{x^2 + x^{1/2} + 1}{x^{1/2}}\, dx$

4. Is the equality in the box true or false? Explain.

   $$\boxed{\int x \sec^2(x^2+1)\, dx = \tan(x^2+1) + C}$$

5. Solve the initial value problem if $f'(x) = x + e^x$ and $f(0) = 4$.

6. A particle moving along the x-axis has acceleration $a(t) = 10\sin(t)$ measured in cm/s^2. Assume the particle as initial velocity $v(0) = 0$ and initial position $s(0) = 0$, find a function that models its velocity, $v(t)$, and its position $s(t)$.