An **antiderivative** of a function f(x) is a function F(x) with F'(x) = f(x).

If F(x) is a particular antiderivative of f(x), then so is F(x) + C for any constant C.

If the domain of f(x) is an interval, and if F(x) is a particular antiderivative of f(x), then any antiderivative has the form F(x) + C for some constant C.

If F(x) and G(x) are antiderivatives of f(x) and g(x) then

- aF(x) is an antiderivative of af(x) for any constant a.
- F(x) + G(x) is an antiderivative of f(x) + g(x).
- **1.** Find a particular antiderivative of $x x^2 + 9$.

2. Find all antiderivatives of $x - x^2 + 9$.

3. Find an antiderivative of $1/x^2$.

4. If F(x) is your answer to the previous problem, does every antiderivative of $1/x^2$ have the form F(x) + C for some constant C?

5. For each of the following functions, find a particular antiderivative.

Function	Antiderivative
x	
x^2	
x^3	
$x^k (k \neq -1)$	
$x^{-1} \text{ for } x > 0$	
x^{-1} for $x < 0$	
x^{-1} for all x	

Function	Antiderivative
sin(x)	
cos(x)	
e^x	
$1/(1+x^2)$	
$sec^2(x)$	
sec(x) tan(x)	
1	

6. Compute three different antiderivatives of $f(x) = x^{20} + 4x^{10} + 8$

7. Compute an antiderivative of $f(t) = \frac{5 \sec t \tan t}{3} - 4 \sin t - \frac{1}{t} + e^2$

8. Compute an antiderivative of $f(x) = \cos(3x)$.

9. Compute the antiderivative of $f(t) = t^2$ that equals 5 when t = 2.

10. A particle moves in a straight line and has acceleration given by $a(t) = 5\cos t - 2\sin t$. Its initial velocity is v(0) = -6 m/s and its initial position is s(0) = 2 m. Find its position function s(t).

11. A stone is dropped from a cliff and hits the ground three seconds later. How high is the cliff? (Acceleration due to gravity is $9.8 \, \text{m/s}^2$.)

12. What constant acceleration is needed to take a car from 10 mph to 60 mph in 5 seconds?