SECTION 4.8: ANTIDERIVATIVES

1. A function F is called an antiderivative of f on an interval I if F′(x) = f(x) for all x in I.

   For f(x) = x, $F(x) = \frac{x^2}{2}$.

   Check: Is F′(x) = f(x)?

2. Thm 1 (page 317) states: If F(x) is an antiderivative of f on an interval I, then the most general antiderivative of f is F(x) + C, where C is any constant.

3. To illustrate the family of antiderivatives for f(x) = x, we could look at the slope (direction) field for f. The slope field for f is a graph of many line segments, drawn at equal intervals both horizontally and vertically. The line segments are drawn with slope = f(x) at x. Once a slope field has been drawn, you can "see" the family of antiderivatives.

   See overhead for slope field of f(x) = x.

4. To find the general antiderivative for a given function, you will need to become familiar with Table 2 on page 318.

5. **EXAMPLES: Find the general antiderivative.**

   A. $f(x) = 1 - x^3 + 12x^5$

   F(x) =

   B. $g(x) = 3e^x + 7\sec^2 x$

   G(X) =

   C. h(x) = cos (3x)

   H(x) =

   D. $k(x) = xe^{x^2}$

   K(x) =

6. **SIMPLE DIFFERENTIAL EQUATIONS**

A. Find f. Given $f''(x) = 3e^x + 5\sin x$.
We have info. to find the general antiderivative

What if we knew $f(0) = 1$ and $f'(0) = 2$. *We have info. to find the exact antiderivative.*

B. A car braked with a constant deceleration of 40 ft/s^2, producing skid marks measuring 160 feet before coming to a stop. How fast was the car traveling when the breaks were first applied?