

Name \_\_\_\_\_

**#7 Even More Integration!**

Find the indefinite integral.

1.  $\int \frac{x^2}{3-x^3} dx$

2.  $\int \frac{(\ln x)^2}{x} dx$

3.  $\int \frac{1}{x \ln(x^2)} dx$

4.  $\int \tan 5\theta d\theta$

5.  $\int \csc 2x dx$

6.  $\int \frac{\cos t}{1 + \sin t} dt$

7.  $\int \frac{\sec x \tan x}{\sec x - 1} dx$

8.  $\int (\sec t + \tan t) dt$

9.  $\int 3^x dx$

10.  $\int e^{\tan 2x} \sec^2 2x dx$

11.  $\int (3-x)7^{(3-x)^2} dx$

12.  $\int \frac{2e^x - 2e^{-x}}{(e^x + e^{-x})^2} dx$

Solve the differential.

13.  $\frac{dr}{dt} = \frac{\sec^2 t}{\tan t + 1}$

Evaluate.

14.  $\int_e^{e^2} \frac{1}{x \ln x} dx$

15.  $\int_0^1 \frac{x-1}{x+1} dx$

16.  $\int_0^2 \frac{x^2 - 2}{x+1} dx$

17.  $\int_{-2}^0 (3^3 - 5^2) dx$

18.  $\int_1^3 \frac{e^x}{x^2} dx$

19.  $\int_{-1}^2 2^x dx$

Find  $f'(x)$ .

20.  $f(x) = \int_1^x \frac{1}{t} dt$

21.  $f(x) = \int_0^x \tan x dx$

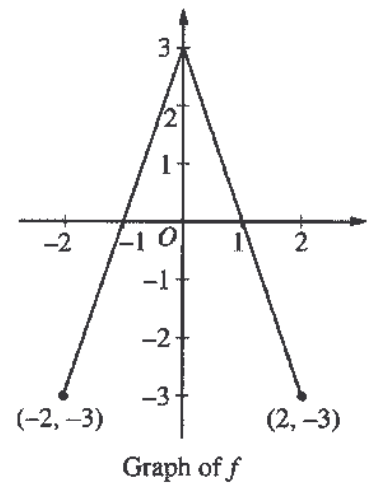
22.  $f(x) = \int_1^{x^2} \frac{1}{t} dt$

23.  $f(x) = \int_x^{3x} e^t dt$

24. The graph of the function  $f$  shown above consists of two line segments.

Let  $g$  be the function given by  $g(x) = \int_0^x f(t) dt$ .

- (a) Find  $g(-1)$ ,  $g'(-1)$ , and  $g''(-1)$ .
- (b) For what values of  $x$  in the open interval  $(-2, 2)$  is  $g$  increasing? Explain your reasoning.
- (c) For what values of  $x$  in the open interval  $(-2, 2)$  is the graph of  $g$  concave down? Explain your reasoning.
- (d) Sketch the graph of  $g$  on the closed interval  $[-2, 2]$ .



25. A cubic polynomial function  $f$  is defined by

$$f(x) = 4x^3 + ax^2 + bx + k$$

where  $a$ ,  $b$ , and  $k$  are constants. The function  $f$  has a local minimum at  $x = -1$ , and the graph of  $f$  has a point of inflection at  $x = -2$ .

- (a) Find the values of  $a$  and  $b$ .
- (b) If  $\int_0^1 f(x) dx = 32$ , what is the value of  $k$ ?