Name_____

#7 Even More Integration!

Find the indefinite integral.

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

$-\frac{1}{3}\ln|3-x^3|+C$

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

$\frac{(\ln|x|)^3}{3}+C$

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

$\frac{1}{2}\ln|\ln|x||+C$

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

$-\frac{1}{5}\ln|\cos 5\theta|+C$

5. $\int \csc 2x dx$

OMIT

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

$\ln|1+\sin t|+C$

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

$\ln|\sec x - 1|+C$

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

OMIT

9. $\int 3^x dx$

$\frac{3^x}{\ln 3}+C$

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

$\frac{1}{2}e^{\tan 2x}+C$

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

$\frac{-7(3-x)^2}{2\ln 7}+C$

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

$\frac{-2}{e^x+e^{-x}}+C$

Solve the differential.

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

$\ln|\tan t+1|+C$

Evaluate.

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

$\ln 2$

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

$1-2\ln 2$

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

0

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

4

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

Find $f'(x)$.

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

$\frac{4}{\ln 2} - \frac{1}{2\ln 2}$

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

$\frac{1}{x}$

21. $f(x) = \int_{0}^{x} \tan x dx$

$\tan x$

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

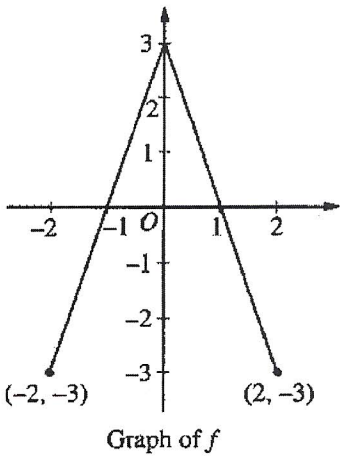
$\frac{1}{x^2} \cdot 2x = \frac{2}{x}$

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

$3e^{3x} - e^x$

24. The graph of the function f shown above consists of two lines segments. Let g be the function given by $g(x) = \int_{0}^{x} f(t)\,dt$.

$A = \frac{1}{2}(1)(3)$



Graph of f

(a) Find $g(-1)$, $g'(-1)$, and $g''(-1)$.

$-\frac{3}{2}$ 0 3

(b) For what values of x in the open interval $(-2,2)$ is g increasing? Explain your reasoning. $(-1, 1)$

(c) For what values of x in the open interval $(-2,2)$ is the graph of g concave down? Explain your reasoning. $(0, 2)$

(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 $x = -2$.

$f'(x) = 12x^2 + 2ax + b$
$f'(-1) = 12 - 2a + b = 0$

$f''(x) = 24x + 2a$
$f''(-2) = -48 + 2a = 0$
$2a = 48$
$a = 24$

(a) Find the values of a and b.

$a = 24$ $b = 36$

$-2a + b = -12$
$-48 + b = -12$
$b = 36$

(b) If $\int_{0}^{1} f(x)\,dx = 32$, what is the value if k?

$\int_0^1 4x^3 + 24x^2 + 36x + k = 32$

$x^4 + 8x^3 + 18x^2 + kx \Big|_0^1 = 32$

$1 + 8 + 18 + k - (0) = 32$
$k = 32 - 27 = 5$