

Name: \_\_\_\_\_  
AP Calc AB: Some Special Antiderivatives

Date: \_\_\_\_\_  
Ms. Loughran

Do Now:

1.  $\int \frac{1}{x} dx =$

2.  $\int e^x dx =$

3.  $\int \cos x dx =$

4.  $\int \sin x dx =$

### Special Antiderivatives

$$\int \frac{1}{x} dx =$$

$$\int e^x dx =$$

$$\int \cos x dx =$$

$$\int \sin x dx =$$

## Exercises and Problems

## Exercises

In Exercises 1-21, find an antiderivative.

1.  $f(x) = 5$

3.  $f(x) = x^2$

5.  $h(t) = \cos t$

7.  $h(z) = \frac{1}{z}$

9.  $g(z) = \frac{1}{z^3}$

11.  $g(t) = \sin t$

13.  $p(t) = t^3 - \frac{t^2}{2} - t$

15.  $p(t) = \cos t + \frac{1}{\cos^2 t}$

17.  $p(\theta) = 2 \sin(2\theta)$

19.  $q(t) = (t+1)^2$

21.  $f(x) = 5x - \sqrt{x}$

2.  $f(x) = 5x$

4.  $g(t) = t^2 + t$

6.  $g(z) = \sqrt{z}$

8.  $r(t) = \frac{1}{t^2}$

10.  $f(z) = e^z$

12.  $f(t) = 2t^2 + 3t^3 + 4t^4$

14.  $q(y) = y^4 + \frac{1}{y}$

16.  $f(t) = \frac{t^2 + 1}{t}$

18.  $r(t) = e^t + 5e^{5t}$

20.  $f(x) = 5^x$

In Exercises 22-32, find the general antiderivative.

22.  $f(t) = 6t$

24.  $f(x) = x^2 - 4x + 7$

26.  $f(z) = z + e^z$

28.  $g(x) = \sin x + \cos x$

30.  $p(t) = 2 + \sin t$

32.  $g(x) = \frac{5}{x^3}$

23.  $h(x) = x^3 - x$

25.  $r(t) = t^3 + 5t - 1$

27.  $g(t) = \sqrt{t}$

29.  $h(x) = 4x^3 - 7$

31.  $p(t) = \frac{1}{\sqrt{t}}$

In Exercises 33-40, find an antiderivative  $F(x)$  with  $F'(x) = f(x)$  and  $F(0) = 0$ . Is there only one possible solution?

33.  $f(x) = 3$

35.  $f(x) = -7x$

37.  $f(x) = x^2$

39.  $f(x) = 2 + 4x + 5x^2$

34.  $f(x) = 2x$

36.  $f(x) = \frac{1}{4}x$

38.  $f(x) = \sqrt{x}$

40.  $f(x) = \sin x$

Find the indefinite integrals in Exercises 41-59.

41.  $\int 5x \, dx$

43.  $\int \sin \theta \, d\theta$

45.  $\int \left(t^2 + \frac{1}{t^2}\right) dt$

47.  $\int (x^2 + 5x + 8) \, dx$

49.  $\int (4t + 7) \, dt$

51.  $\int 5e^z \, dz$

53.  $\int \sin t \, dt$

55.  $\int \left(t\sqrt{t} + \frac{1}{t\sqrt{t}}\right) dt$

57.  $\int e^{2r} \, dr$

59.  $\int \left(\frac{y^2 - 1}{y}\right)^2 dy$

42.  $\int x^3 \, dx$

44.  $\int (x^3 - 2) \, dx$

46.  $\int 4\sqrt{w} \, dw$

48.  $\int \frac{4}{t^2} \, dt$

50.  $\int \cos \theta \, d\theta$

52.  $\int \left(x + \frac{1}{\sqrt{x}}\right) dx$

54.  $\int (\pi + x^{11}) \, dx$

56.  $\int \cos(x+1) \, dx$

58.  $\int \frac{1}{e^z} \, dz$

In Exercises 60-71, evaluate the definite integrals exactly [as in  $\ln(3\pi)$ ], using the Fundamental Theorem, and numerically [ $\ln(3\pi) \approx 2.243$ ]:

60.  $\int_0^3 (x^2 + 4x + 3) \, dx$

62.  $\int_0^{\pi/4} \sin x \, dx$

64.  $\int_2^5 (x^3 - \pi x^2) \, dx$

66.  $\int_1^2 \frac{1+y^2}{y} \, dy$

68.  $\int_0^{\pi/4} (\sin t + \cos t) \, dt$

70.  $\int_{-3}^{-1} \frac{2}{r^3} \, dr$

61.  $\int_1^3 \frac{1}{t} \, dt$

63.  $\int_0^2 3e^x \, dx$

65.  $\int_0^1 \sin \theta \, d\theta$

67.  $\int_0^2 \left(\frac{x^3}{3} + 2x\right) dx$

69.  $\int_0^1 2e^x \, dx$

71.  $\int_0^{\pi/4} \frac{1}{\cos^2 x} \, dx$