

## 4.11E: Exercises for Section 4.10

In exercises 1 - 20, find the antiderivative  $F(x)$  of each function  $f(x)$ .

1)  $f(x) = \frac{1}{x^2} + x$

2)  $f(x) = e^x - 3x^2 + \sin x$

**Answer**

$$F(x) = e^x - x^3 - \cos x + C$$

3)  $f(x) = e^x + 3x - x^2$

4)  $f(x) = x - 1 + 4 \sin(2x)$

**Answer**

$$F(x) = \frac{x^2}{2} - x - 2 \cos(2x) + C$$

5)  $f(x) = 5x^4 + 4x^5$

6)  $f(x) = x + 12x^2$

**Answer**

$$F(x) = \frac{1}{2}x^2 + 4x^3 + C$$

7)  $f(x) = \frac{1}{\sqrt{x}}$

8)  $f(x) = (\sqrt{x})^3$

**Answer**

$$F(x) = \frac{2}{5}(\sqrt{x})^5 + C$$

9)  $f(x) = x^{1/3} + (2x)^{1/3}$

10)  $f(x) = \frac{x^{1/3}}{x^{2/3}}$

**Answer**

$$F(x) = \frac{3}{2}x^{2/3} + C$$

11)  $f(x) = 2 \sin(x) + \sin(2x)$

12)  $f(x) = \sec^2 x + 1$

**Answer**

$$F(x) = x + \tan x + C$$

13)  $f(x) = \sin x \cos x$

14)  $f(x) = \sin^2(x) \cos(x)$

**Answer**

$$F(x) = \frac{1}{3} \sin^3(x) + C$$

15)  $f(x) = 0$

16)  $f(x) = \frac{1}{2} \csc^2 x + \frac{1}{x^2}$

**Answer**

$$F(x) = -\frac{1}{2}\cot x - \frac{1}{x} + C$$

17)  $f(x) = \csc x \cot x + 3x$

18)  $f(x) = 4 \csc x \cot x - \sec x \tan x$

**Answer**

$$F(x) = -\sec x - 4 \csc x + C$$

19)  $f(x) = 8(\sec x)(\sec x - 4 \tan x)$

20)  $f(x) = \frac{1}{2}e^{-4x} + \sin x$

**Answer**

$$F(x) = -\frac{1}{8}e^{-4x} - \cos x + C$$

**For exercises 21 - 29, evaluate the integral.**

21)  $\int (-1) dx$

22)  $\int \sin x dx$

**Answer**

$$\int \sin x dx = -\cos x + C$$

23)  $\int (4x + \sqrt{x}) dx$

24)  $\int \frac{3x^2 + 2}{x^2} dx$

**Answer**

$$\int \frac{3x^2 + 2}{x^2} dx = 3x - \frac{2}{x} + C$$

25)  $\int (\sec x \tan x + 4x) dx$

26)  $\int (4\sqrt{x} + \sqrt[4]{x}) dx$

**Answer**

$$\int (4\sqrt{x} + \sqrt[4]{x}) dx = \frac{8}{3}x^{3/2} + \frac{4}{5}x^{5/4} + C$$

27)  $\int (x^{-1/3} - x^{2/3}) dx$

28)  $\int \frac{14x^3 + 2x + 1}{x^3} dx$

**Answer**

$$\int \frac{14x^3 + 2x + 1}{x^3} dx = 14x - \frac{2}{x} - \frac{1}{2x^2} + C$$

$$29) \int (e^x + e^{-x}) dx$$

In exercises 30 - 34, solve the initial value problem.

$$30) f'(x) = x^{-3}, \quad f(1) = 1$$

**Answer**

$$f(x) = -\frac{1}{2x^2} + \frac{3}{2}$$

$$31) f'(x) = \sqrt{x} + x^2, \quad f(0) = 2$$

$$32) f'(x) = \cos x + \sec^2(x), \quad f\left(\frac{\pi}{4}\right) = 2 + \frac{\sqrt{2}}{2}$$

**Answer**

$$f(x) = \sin x + \tan x + 1$$

$$33) f'(x) = x^3 - 8x^2 + 16x + 1, \quad f(0) = 0$$

$$34) f'(x) = \frac{2}{x^2} - \frac{x^2}{2}, \quad f(1) = 0$$

**Answer**

$$f(x) = -\frac{1}{6}x^3 - \frac{2}{x} + \frac{13}{6}$$

In exercises 35 - 39, find two possible functions  $f$  given the second- or third-order derivatives

$$35) f''(x) = x^2 + 2$$

$$36) f''(x) = e^{-x}$$

**Answer**

Answers may vary; one possible answer is  $f(x) = e^{-x}$

$$37) f''(x) = 1 + x$$

$$38) f'''(x) = \cos x$$

**Answer**

Answers may vary; one possible answer is  $f(x) = -\sin x$

$$39) f'''(x) = 8e^{-2x} - \sin x$$

40) A car is being driven at a rate of 40 mph when the brakes are applied. The car decelerates at a constant rate of  $10 \text{ ft/sec}^2$ . How long before the car stops?

**Answer**

5.867sec

41) In the preceding problem, calculate how far the car travels in the time it takes to stop.

42) You are merging onto the freeway, accelerating at a constant rate of  $12 \text{ ft/sec}^2$ . How long does it take you to reach merging speed at 60 mph?

**Answer**

7.333sec

43) Based on the previous problem, how far does the car travel to reach merging speed?

44) A car company wants to ensure its newest model can stop in 8 sec when traveling at 75 mph. If we assume constant deceleration, find the value of deceleration that accomplishes this.

**Answer**

$$13.75 \text{ ft/sec}^2$$

45) A car company wants to ensure its newest model can stop in less than 450 ft when traveling at 60 mph. If we assume constant deceleration, find the value of deceleration that accomplishes this.

**In exercises 46 - 51, find the antiderivative of the function, assuming  $F(0) = 0$ .**

46) [T]  $f(x) = x^2 + 2$

**Answer**

$$F(x) = \frac{1}{3}x^3 + 2x$$

47) [T]  $f(x) = 4x - \sqrt{x}$

48) [T]  $f(x) = \sin x + 2x$

**Answer**

$$F(x) = x^2 - \cos x + 1$$

49) [T]  $f(x) = e^x$

50) [T]  $f(x) = \frac{1}{(x+1)^2}$

**Answer**

$$F(x) = -\frac{1}{x+1} + 1$$

51) [T]  $f(x) = e^{-2x} + 3x^2$

**In exercises 52 - 55, determine whether the statement is true or false. Either prove it is true or find a counterexample if it is false.**

52) If  $f(x)$  is the antiderivative of  $v(x)$ , then  $2f(x)$  is the antiderivative of  $2v(x)$ .

**Answer**

True

53) If  $f(x)$  is the antiderivative of  $v(x)$ , then  $f(2x)$  is the antiderivative of  $v(2x)$ .

54) If  $f(x)$  is the antiderivative of  $v(x)$ , then  $f(x) + 1$  is the antiderivative of  $v(x) + 1$ .

**Answer**

False

55) If  $f(x)$  is the antiderivative of  $v(x)$ , then  $(f(x))^2$  is the antiderivative of  $(v(x))^2$ .

---

4.11E: Exercises for Section 4.10 is shared under a [not declared](#) license and was authored, remixed, and/or curated by LibreTexts.

- [4.10E: Exercises for Section 4.10](#) is licensed [CC BY-NC-SA 4.0](#).