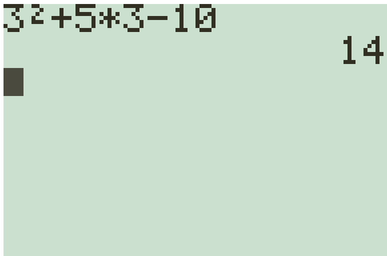
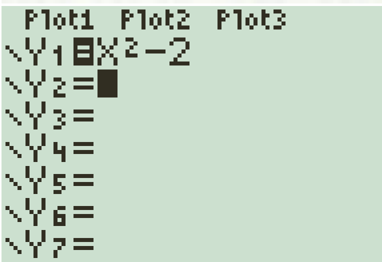
PRACTICE PROBLEMS 1

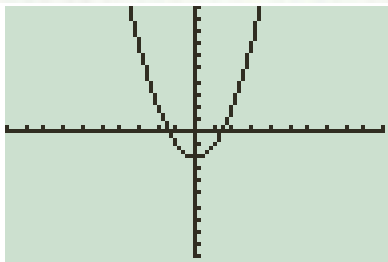
1. Is the point (3, 12) on the graph of the function $g(x) = x^2 + 5x - 10$?



$14 \neq 12$, so <u>NO</u>.

2. Sketch the graph of the function $h(t) = t^2 - 2$.





You could also sketch this easily by hand by plugging in numbers for "t" and seeing what "h(t)" is.

t	h(t)
0	-2
1	-1
-1	-1
2	2
-2	2

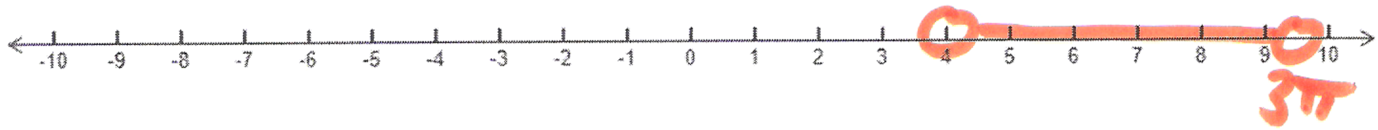
EXERCISES 1

Draw the following intervals on the number line.

1. $[-1, 4]$
2. $(4, 3\pi)$ [*Hint:* π is approximately equal to 3.14 . . . .]
3. $[-2, \sqrt{2})$ [*Hint:* $\sqrt{2}$ is approximately equal to 1.41 . . . .]
4. $[1, \frac{3}{2}]$
5. $(-\infty, 3)$
6. $(4, \infty)$

1.

2.



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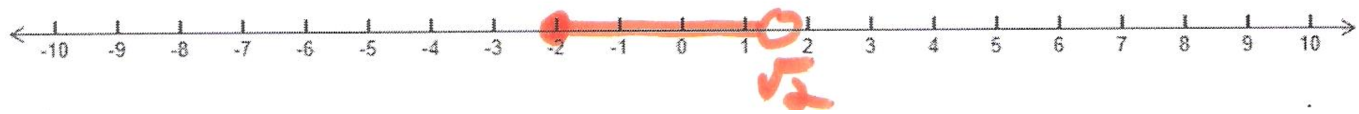

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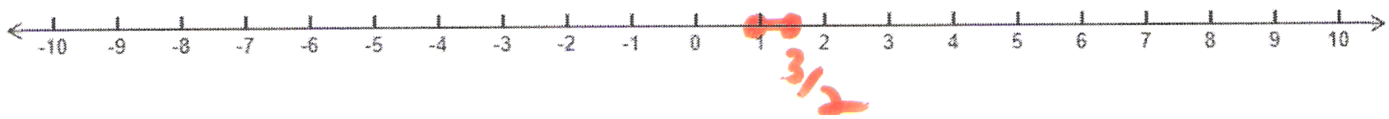

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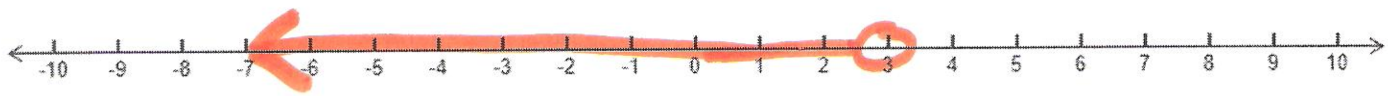

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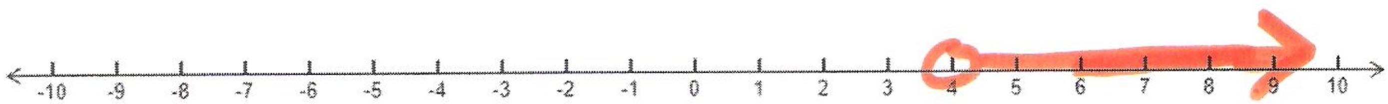


Use intervals to describe the real numbers satisfying the inequalities in Exercises 7–12.

7. $2 \le x < 3$

8. $-1 < x < \frac{3}{2}$

9. $x < 0, x \ge -1$

10. $x \ge -1, 34x < 8$

11. $x < 3$

12. $x \ge \sqrt{2}$

7. $[\mathbf{2}, \mathbf{3})$

8. $(-\mathbf{1}, \frac{\mathbf{3}}{\mathbf{2}})$

9. $[-\mathbf{1}, \mathbf{0})$

10. $[-\mathbf{1.34}, \mathbf{8})$

11. **(-∞,3)**

12. $[\sqrt{2}$**,∞)**

13. If $f(x) = x^2 - 3x$, find $f(0)$, $f(5)$, $f(3)$, and $f(-7)$.

```
0²-3*0
                 0
5²-3*5
                10
3²-3*3
                 0
```

```
(-7)²-3(-7)
                70
```

14. If $f(x) = 9 - 6x + x^2$, find $f(0)$, $f(2)$, $f(3)$, and $f(-13)$.

```
9-6*0+0²
                 9
9-6*2+2²
                 1
9-6*3+3²
                 0
```

```
9-6(-13)+(-13)²
               256
```

15. If $f(x) = x^3 + x^2 - x - 1$, find $f(1)$, $f(-1)$, $f(\frac{1}{2})$, and $f(a)$.

```
1^3+1²-1-1
                 0
(-1)^3+(-1)²-(-1
)-1
                 0
.5^3+.5²-.5-1
            -1.125
```

$f(a) = a^3 + a^2 - a + 1$ **(Just change "x" to "a")**

16. If $g(t) = t^3 - 3t^2 + t$, find $g(2)$, $g(-\frac{1}{2})$, $g(\frac{2}{3})$, and $g(a)$.

```
2^3-3*2²+2
                -2
(-.5)^3-3(-.5)²+
(-.5)
            -1.375
```

```
(2/3)^3-3(2/3)²+
(2/3)
     -.3703703704
```

$g(a) = a^3 - 3a^2 + a$

17. If $h(s) = s/(1 + s)$, find $h(\frac{1}{2})$, $h(-\frac{3}{2})$, and $h(a + 1)$.

```
.5/(1+.5)
      .3333333333
-1.5/(1+-1.5)
                 3
```

$h(a+1) = \frac{a+1}{1+a+1} = \frac{a+1}{a+2}$ **… Plug in "a+1" for "x" and simplify**

18. If $f(x) = x^2/(x^2 - 1)$, find $f(\frac{1}{2})$, $f(-\frac{1}{2})$, and $f(a + 1)$.

```
.5²/(.5²-1)
     -.3333333333
(-.5)²/((-.5)²-1
)
     -.3333333333
```

$f(a+1) = {(a+1)^2}/{((a+1)^2 - 1)}$

19. If $f(x) = x^2 - 2x$, find $f(a+1)$ and $f(a+2)$.

$f(a+1) = (a+1)^2 - 2(a+1)$ **and** $f(a+2) = (a+2)^2 - 2(a+2)$

You theoretically could simplify these by multiplying them out (FOIL) and combining like terms, but there's no reason to do that.

20. If $f(x) = x^2 + 4x + 3$, find $f(a-1)$ and $f(a-2)$.

$f(a-1) = (a-1)^2 + 4(a-1) + 3$ **and** $f(a-2) = (a-2)^2 + 4(a-2) + 3$

You theoretically could simplify these by multiplying them out (FOIL) and combining like terms, but there's no reason to do that.

21. An office supply firm finds that the number of Remington typewriters sold in year x is given approximately by the function $f(x) = 50 + 4x + \frac{1}{2}x^2$, where $x = 0$ corresponds to 1980.

(a) What does $f(0)$ represent?

(b) Find the number of Remington typewriters sold in 1982.

This problem gives you an idea of how old the book this problem came from is.

a. $f(0) = 50$ **would mean 50 typewriters were sold in 1980 (0 years after the start of the problem)**
b. **1982 is 2 years after the start of the problem, so find** $f(2)$

```
50+4*2+.5*2²
                60
```

60 typewriters

22. When a solution of acetylcholine is introduced into the heart muscle of a frog, it diminishes the force with which the muscle contracts. The data from experiments of A. J. Clark are closely approximated by a function of the form

$$R(x) = \frac{100x}{b + x}, \qquad x \geq 0,$$

where x is the concentration of acetylcholine (in appropriate units), b is a positive constant that depends on the particular frog, and $R(x)$ is the response of the muscle to the acetylcholine, expressed as a percentage of the maximum possible effect of the drug.

(a) Suppose that $b = 20$. Find the response of the muscle when $x = 60$.

(b) Determine the value of b if $R(50) = 60$—that is, if a concentration of $x = 50$ units produces a 60% response.

NOTE: Out of all the problems on this worksheet, #22 is the LEAST important. However, here's how you do it.

a. If $b = 20$, then $R(x) = \frac{100x}{20+x}$. We need to find $R(60)$.

```
100*60/(20+60)
                 75
```

… So the response is 75% of the maximum.

b. $\frac{100 \cdot 50}{b+50} = 60$ … So, $60(b+50) = 5000$ … So $60b + 3000 = 5000$

```
5000-3000
               2000
Ans/60
         33.33333333
```

In Exercises 23–26, describe the domain of the function.

23. $f(x) = \dfrac{8x}{(x-1)(x-2)}$

24. $f(t) = \dfrac{1}{\sqrt{t}}$

25. $g(x) = \dfrac{1}{\sqrt{3-x}}$

26. $g(x) = \dfrac{4}{x(x+2)}$

23. x can't equal 1 or 2 … So (-∞,1) , (1,2) , and (2,∞)

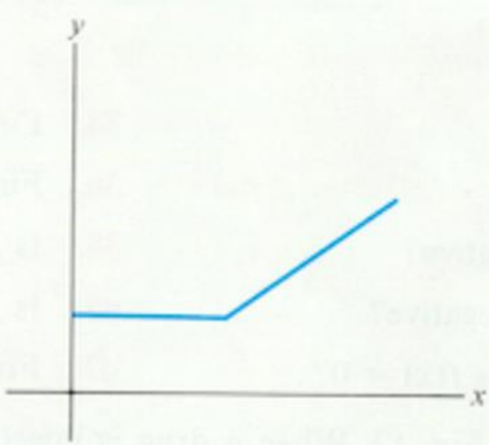
24. t can't equal 0 AND t can't be negative … So (0, ∞)

25. $3 - x > 0$ ➔ $3 > x$, or $x < 3$ … So (-∞,3)

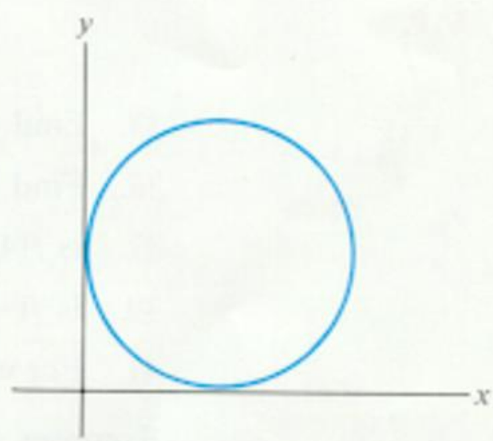
26. x can't equal 0 or -2 … So (-∞,-2) , (-2,0) , and (0,∞)

In Exercises 27–32, decide which curves are graphs of functions.

27.



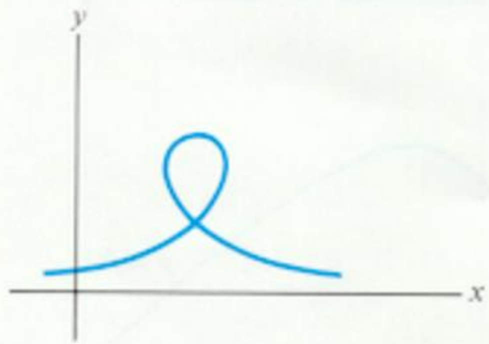
28.



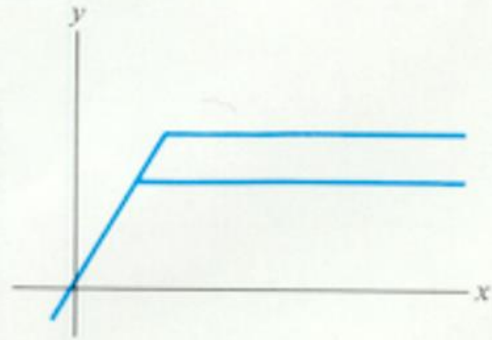
27. Yes

28. No (vertical line would touch the graph twice)

29.

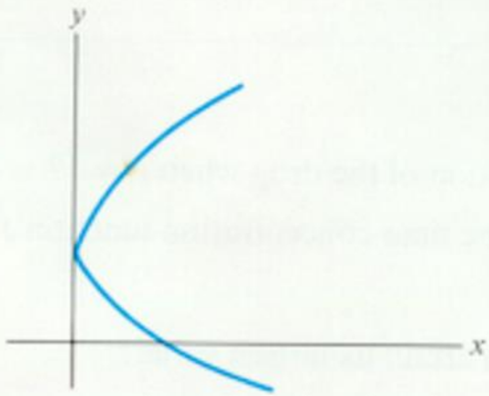


30.

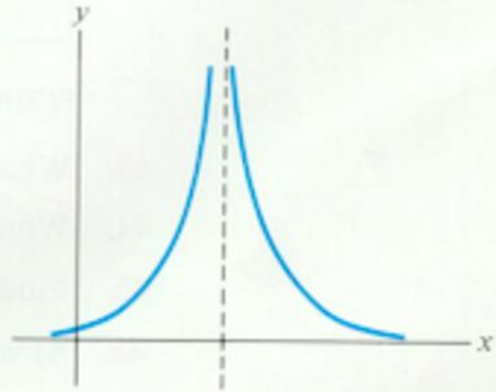


29. **No**
30. **No**

31.



32.



31. **No**
32. **Yes**

Exercises 33–42 relate to the function whose graph is sketched in Fig. 11.

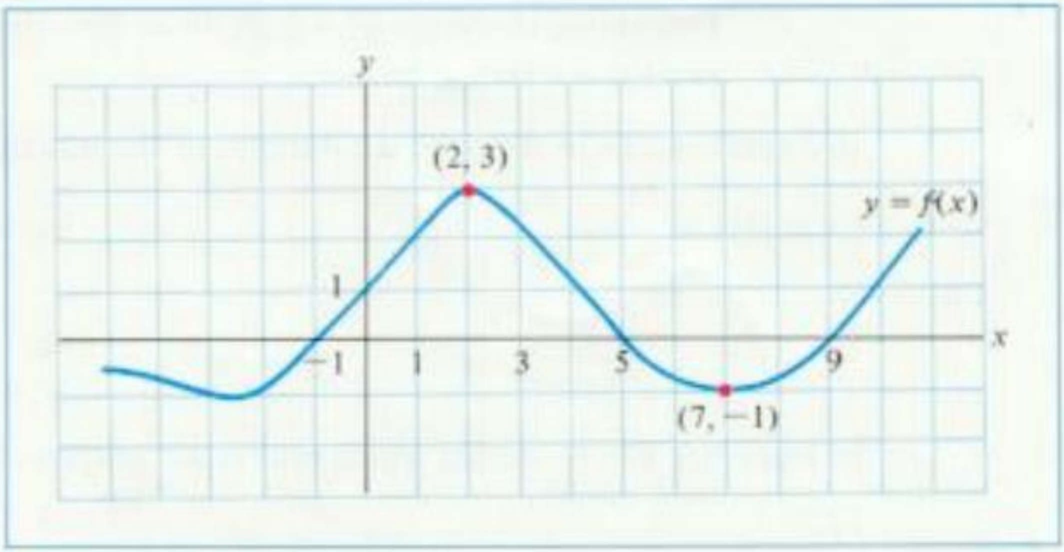


FIGURE 11

33. Find $f(0)$.

34. Find $f(7)$.

33. **f(0) = 1**
(Just find the y-value on the graph)

34. **f(7) = -1**

35. Find $f(2)$.

36. Find $f(-1)$.

35. **f(2) = 3**

36. **f(-1) = 0**

37. Is $f(4)$ positive or negative?

38. Is $f(6)$ positive or negative?

37. **Positive (above the x-axis)**

38. **Negative**

39. Is $f(-\frac{1}{2})$ positive or negative?

40. Is $f(1)$ greater than $f(6)$?

39. **Positive**

40. **Yes (since f(1) is positive, f(6) negative)**

41. For what values of x is $f(x) = 0$?

42. For what values of x is $f(x) \geq 0$?

41. **-1, 5, and 9**

41. **(-1, 5) and (9, ∞)**

Exercises 43–46 relate to Fig. 12. When a drug is injected into a person's muscle tiss the concentration y of the drug in the blood is a function of the time elapsed since t injection. The graph of a typical time-concentration function f is given in Fig. 12, wh $t = 0$ corresponds to the time of the injection.

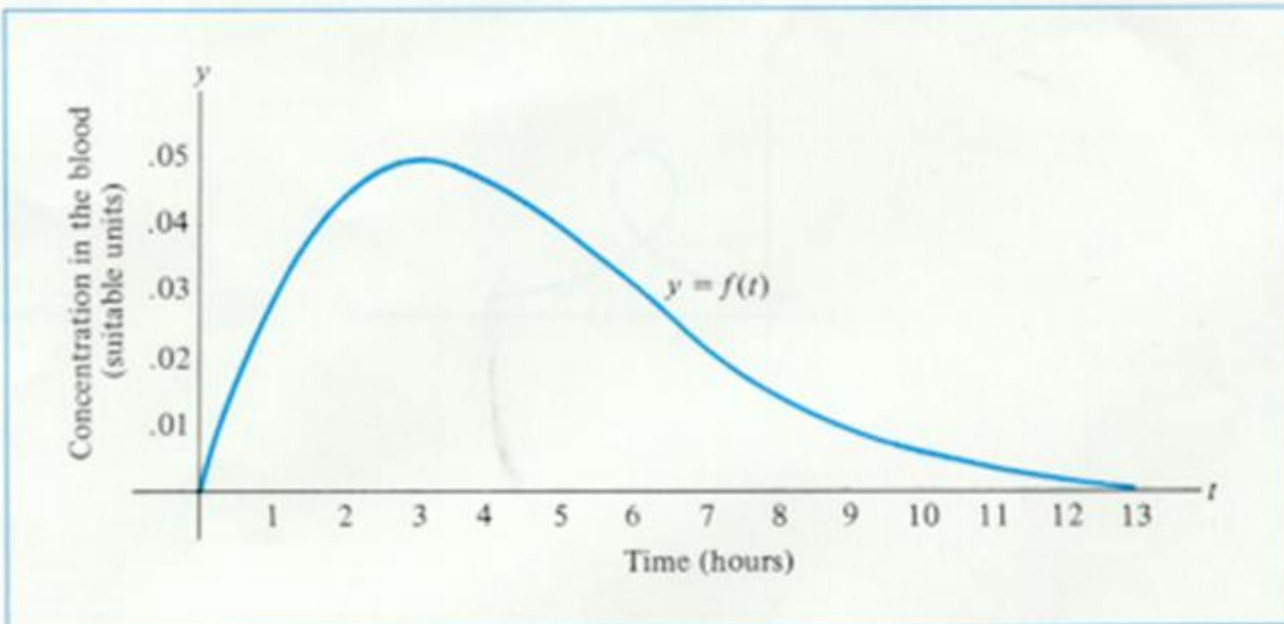


FIGURE 12

43. What is the concentration of the drug when $t = 1$?

Approximately .02 (find the y-value when t = 1)

44. What is the value of the time-concentration function f when $t = 6$?

Approximately .03

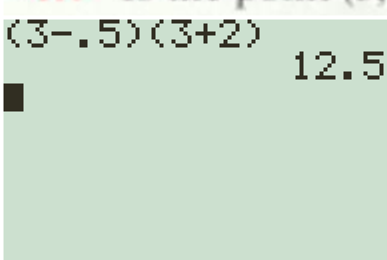
45. Find $f(5)$.

Approximately .04

46. At what time does $f(t)$ attain its largest value?

About 3 seconds (when the graph is at the top)

47. Is the point (3, 12) on the graph of the function $f(x) = (x - \frac{1}{2})(x + 2)$?



$12.5 \neq 12$, so NO

48. Is the point $(-2, 12)$ on the graph of the function $f(x) = x(5 + x)(4 - x)$?

```
-2(5+-2)(4--2)
                  -36
```

$-36 \neq 12$, **so NO**