

## 9.2 Power Functions and Their Graphs

1)

a) Domain =  $\{x : - < x < \}$

b) Range =  $\{y : - < y < \}$

c) Quadrants I and III

d)  $f(-x) = (-x)^7 = ((-1)(x))^7 = (-1)^7(x)^7 = (-1)(x^7) = -(x^7) = -f(x)$

3)

Enter left side of equation as  $Y_1$  and the right side of the equation as  $Y_2$ .

The  $x$ -coordinate(s) of the intersecting point(s) is (are) the approximate solution(s).

a)  $x = 2$

b)  $x = -2.97$

c)  $x = -1$  or  $x = 1$

5)

a)  $2x^4 = 50$

$$x^4 = 25$$

$$(x^4)^{1/4} = \pm(25)^{1/4}$$

$$x = \pm 5^{1/2}$$

$$x = \pm\sqrt{5}$$

b)  $x^8 = -81$

$$(x^8)^{1/8} = (-81)^{1/8}$$

No solution: See Fact 9.3 ( $n$  is even and  $a < 0$ )

c)  $(x - 5)^2 + 6 = 55$

$$(x - 5)^2 = 49$$

$$\sqrt{(x - 5)^2} = \pm\sqrt{49}$$

$$x - 5 = \pm 7$$

$$x = \pm 7 + 5$$

$$x = 12 \text{ or } x = -2$$

7)

a)  $x = 27.9841$

b) No real solution;  $x^{1/4} = -2.3$  because even root functions appear only above the  $x$ -axis.

c)  $x = 18.89568$

d)  $x = -18.89568$       Odd root functions appear above & below  $x$ -axis

9)  $x - 3 = \sqrt{-2x + 6}$

$$(x-3)^2 = (\sqrt{-2x+6})^2$$

$$x^2 - 6x + 9 = -2x + 6$$

$$x^2 - 4x + 3 = 0$$

$$x^2 - x - 3x + 3 = 0$$

$$(x^2 - x) + (-3x + 3) = 0$$

$$x(x-1) + (-3)(x-1) = 0$$

$$(x-3)(x-1) = 0$$

$$(x-3) = 0 \text{ or } (x-1) = 0$$

$$x = 3 \text{ or } x = 1$$

$x = 1$  is an extraneous solution:

$$(1) -3 = \sqrt{-2(-1) + 6}$$

$$-2 = \sqrt{4}$$

$$-2 \neq 2$$

Yes—both graphs only intersect at one point:  $(3,0)$   $x = 3$

- 11) The functions are not inverses of each other. We can easily see  $Y_1[Y_2(-1)]$  is undefined. This implies  $Y_1[Y_2(x)] \neq x$  for all  $x$  in the domain of  $Y_2$ . (See Definition 9.5).

13)

a) Yes Graph is symmetric about the line  $y = x$

b) No Graph is not symmetric about the line  $y = x$

- 15) Following Fact 9.8, both functions will be inverses of each other if  $N(P(N)) = N$  for all  $N$  in the domain of  $P$  and  $P(N(P)) = P$  for all  $P$  in the domain of  $N$ .

$$N(P(N)) = (-23) \frac{-N + 480}{23} + 480$$

$$N(P(N)) = -(-N + 480) + 480$$

$$N(P(N)) = N - 480 + 480$$

$$N(P(N)) = N$$

$$P(N(P)) = \frac{-(-23P + 480) + 480}{23}$$

$$P(N(P)) = \frac{23P - 480 + 480}{23}$$

$$P(N(P)) = \frac{23P}{23}$$

$$P(N(P)) = P$$

Both functions are inverses of each other.

**Skill and Review**

17) 40 is about  $\frac{1}{3}$  of the way between  $36 = 6^2$  and  $49 = 7^2$ , from which we can reasonably conclude that  $\sqrt{40}$  is about  $\frac{1}{3}$  of the way between 6 and 7. A good estimate is  $\sqrt{40} \approx 6.3$ .

19)

- a) Basic absolute value function
- b) Basic square root function
- c) Basic linear function
- d) Basic reciprocal function
- e) Basic quadratic function
- f) Basic cubic function