12: Power Functions --- Answers

1. Linear functions model things where there is a constant rate of change. Power functions will model something in which the rate changes.

2.
   a) \( y = x^2 \)
   b) \( y = x^{1/6} \)
   c) \( y = x^{-2} \)
   d) \( y = x^{1/2} \)
   e) \( y = x^6 \)
   f) \( y = x^{-1/2} \)

3. For any real number \( a \), \( 1^a = 1 \).

4.
   a) 4
   b) 16,384
   c) 625
   d) \( \approx 5.623 \)

5.
   a) \( 3\sqrt[5]{x^9} \)
   b) \( \sqrt[3]{x^4} \)
   c) \( 6\sqrt[5]{x^{54}} \)
   d) \( 8\sqrt[4]{x^7} \)

6. The exponent is greater than 1 or less than 0.
7. The exponent is between 0 and 1.

8.
   a) 5
   b) 2
   c) \( \approx 5.25 \)

9.
   a) It is not a linear function because the rate of change does not remain constant.
   b) Since the graph is concave down so \( 0 < p < 1 \).

10. If the exponent is positive on a power function, the \( y \)-intercept will be 0. If the exponent is negative there is no \( y \)-intercept.

11.
   a) Yes; \( f(x) = x^5 \)
   b) Yes; \( f(x) = 4x^2 \)
   c) Yes; \( f(x) = x^{3/10} \)
   d) No; since \( f(0) \neq 0 \).

12.
   a) Yes; \( y = x^{3/4} \)
   b) Yes; \( y = 2x^3 \) (if we ignore when \( x = 0 \))
   c) No (this is a linear function if we ignore when \( x = 0 \))

13. Very well. For Neptune, \( d^{3/2} = 164.32 \) (rounded), compared to 164.82.
    For Pluto, \( d^{3/2} = 248.54 \) (rounded), compared to 248.6.