

(answers only)

I. Determine which are power functions, circle YES or NO. If YES, state value of k and p.

- 1.) $f(x) = 13\sqrt[3]{x}$ power function? Circle one: YES NO where $k = \underline{13}$ and $p = \underline{1}$
- 2.) $3y = 9x^2$ power function? Circle one: YES NO where $k = \underline{3}$ and $p = \underline{2}$
- 3.) $f(x) = 2(x+5)^3$ power function? Circle one: YES NO where $k = \underline{X}$ and $p = \underline{X}$
- 4.) $y - 1 = 2x^2 - 1$ power function? Circle one: YES NO where $k = \underline{2}$ and $p = \underline{2}$
- 5.) $f(x) = \sqrt[25]{x^3}$ power function? Circle one: YES NO where $k = \underline{5}$ and $p = \underline{-3/2}$
- 6.) $y = \sqrt[4]{81x^2}$ power function? Circle one: YES NO where $k = \underline{3}$ and $p = \underline{1/2}$
- 7.) $f(x) = 6 \cdot 3^x$ power function? Circle one: YES NO where $k = \underline{4}$ and $p = \underline{X}$
- 8.) $y = 4(x-2)(x+2) + 16$ power function? Circle one: YES NO where $k = \underline{X}$ and $p = \underline{2}$
- 9.) $y = 2x^3 + 5$ power function? Circle one: YES NO where $k = \underline{X}$ and $p = \underline{X}$
- 10.) $y + 9 = (3 - 2x)(3 + 2x)$ power function? Circle one: YES NO where $k = \underline{-4}$ and $p = \underline{2}$

II. Find an equation of a power function that goes through the given two points. SHOW WORK!!

11.) (3, 30) and (1, 5)	12.) (7, 8) and (1, 0.7)	13.) (6, 17) and (1, 2)
$y = 5x^{1.631}$	$y = .7x^{1.252}$	$y = 2x^{1.194}$
14.) (4, 3) and (9, 4.5)	15.) (6, 162) and (8, 384)	16.) $(2, \frac{64}{3})$ and $(-3, 243)$
$y = 1.5x^{.5}$ or $y = \frac{3\sqrt{x}}{2}$	$y = \frac{3}{4}x^3$	$y = \frac{1}{3}x^6$

III. Complete each variation problem. MUST SHOW WORK FOR CREDIT!!

17.) Suppose y is directly proportional to x. If $y = 6$ when $x = 4$, find the constant of proportionality (k). Write a formula for y then use it to find x when $y = 8$.	18.) Suppose y is inversely proportional to x. If $y = 2$ when $x = 3$, find the constant of proportionality (k). Write a formula for y then use it to find x when $y = 8$.
$y = 1.5x \rightarrow x = \frac{16}{3}$	$y = \frac{6}{x} \rightarrow x = \frac{3}{4}$
19.) Suppose c is directly proportional to the square of d. If $c = 45$ when $d = 3$, find the constant of proportionality (k). Write a formula for c then use it to find c when $d = 5$.	20.) Suppose h is inversely proportional to the cube of t. If $h = .002$ when $t = 5$, find the constant of proportionality (k). Write a formula for h then use it to find t when $h = \frac{-1}{108}$.
$c = 5d^2 \rightarrow c = 125$	$h = \frac{1}{4t^3} \rightarrow t = -3$

IV. Complete each application below. MUST SHOW WORK FOR CREDIT!!

21.) A 30-second commercial during Super Bowl XXXVI in 2002 cost advertisers 2 million dollars. For the first Super Bowl in 1967, an advertiser could have purchased approximately 22,989 minutes of advertising time for the same amount of money. Write a function that expresses the above situation.	22.) A person's weight, w , on a planet of radius d , is given by $w = k \cdot d^{-2}$ where the constant k depends on the masses of the person and the planet. A man weighs 180 lbs. on the surface of the earth. How much does he weigh on the surface of a planet whose mass is the same as the earth's, but whose radius is three times as large?
$y = 1588.13467x^{1.0511}$	20 lbs

Adv Functions - Power funct/Eq WS.

11) $(3, 30)$ and $(1, 5) \rightarrow k=5$

$$Y = 5x^p$$

$$\frac{30}{5} = \frac{5 \cdot 3^p}{5}$$

$$6 = 3^p$$

$$\frac{\log 6}{\log 3} = \frac{p \log 3}{\log 3}$$

$$p = 1.631$$

$$Y = 5x^{1.631}$$

12) $(7, 8)$ and $(1, 0.7) \rightarrow k=.7$

$$Y = .7x^p$$

$$\frac{8}{.7} = \frac{.7 \cdot 7^p}{.7}$$

$$\frac{80}{7} = 7^p$$

$$\frac{\log(\frac{80}{7})}{\log 7} = \frac{p \log 7}{\log 7}$$

$$p = 1.252$$

$$Y = .7x^{1.252}$$

13) $(6, 17)$ and $(1, 2) \rightarrow k=2$

$$Y = 2x^p$$

$$\frac{17}{2} = \frac{2 \cdot 6^p}{2}$$

$$8.5 = 6^p$$

$$\frac{\log 8.5}{\log 6} = \frac{p \log 6}{\log 6}$$

$$p = 1.194$$

$$Y = 2x^{1.194}$$

14) $(4, 3)$ and $(9, 4.5)$

$$\frac{3}{4^p} = \frac{k \cdot 4^p}{4^p}$$

$$k = \frac{3}{4^p}$$

$$k = \frac{2}{4.5}$$

$$k = 1.5$$

$$Y = 1.5x^{.5}$$

or $Y = \frac{3\sqrt{x}}{2}$

$$4.5 = k \cdot 9^p$$

$$4.5 = \frac{3}{4^p} \cdot 9^p$$

$$\frac{4.5}{3} = \frac{3(\frac{9}{4})^p}{3}$$

$$1.5 = (\frac{9}{4})^p$$

$$\frac{\log 1.5}{\log(\frac{9}{4})} = \frac{p \log(\frac{9}{4})}{\log(\frac{9}{4})}$$

$$p = .5 \text{ or } \frac{1}{2}$$

15) $(6, 162)$ and $(8, 384)$

$$\frac{162}{6^p} = \frac{k \cdot 6^p}{6^p}$$

$$k = \frac{162}{6^p}$$

$$k = \frac{162}{6^3}$$

$$k = .75 \text{ or } \frac{3}{4}$$

$$Y = \frac{3}{4}x^3$$

$$384 = k \cdot 8^p$$

$$384 = \frac{162}{6^p} \cdot 8^p$$

$$\frac{384}{162} = \frac{162(\frac{4}{3})^p}{162}$$

$$\frac{64}{27} = \frac{4^p}{3^p}$$

$$\frac{4^3}{3^3} = \frac{4^p}{3^p} \text{ so } p=3$$

16) $(2, \frac{64}{3})$ and $(-3, 243) \Rightarrow Y = \frac{1}{3}x^6$

$$\frac{64}{3} = \frac{k \cdot 2^p}{2^p}$$

$$k = \frac{64}{2^p} = \frac{64}{3 \cdot 2^p}$$

$$k = \frac{64}{3 \cdot 2^6}$$

$$k = \frac{1}{3}$$

$$243 = k(-3)^p$$

$$243 = \frac{64}{3 \cdot 2^p} \cdot (-3)^p$$

$$243 = \frac{64}{3} \left(\frac{-3}{2}\right)^p$$

$$\frac{729}{64} = \frac{(-3)^p}{2^p}$$

$$\frac{(\pm 3)^6}{2^6} = \frac{(-3)^p}{2^p} \text{ so } p=6$$

$$17) Y = K \cdot X \rightarrow \boxed{Y = 1.5X \text{ or } Y = \frac{3}{2}X}$$

$$\frac{6}{4} = K \cdot \frac{4}{4}$$

$$K = 1.5$$

$$\frac{8}{1.5} = \frac{1.5X}{1.5}$$

$$\boxed{X = 5.3 \text{ or } \frac{16}{3}}$$

$$18) Y = \frac{K}{X} \rightarrow \boxed{Y = \frac{6}{X}}$$

$$2 = \frac{K}{3}$$

$$K = 6$$

$$8 = \frac{6}{X}$$

$$\frac{8X}{8} = \frac{6}{8}$$

$$\boxed{X = .75 \text{ or } \frac{3}{4}}$$

$$19) C = Kd^2 \rightarrow \boxed{C = 5d^2}$$

$$45 = K \cdot (3)^2$$

$$\frac{45}{9} = \frac{K \cdot 9}{9}$$

$$K = 5$$

$$C = 5 \cdot (5)^2$$

$$\boxed{C = 125}$$

$$20) h = \frac{K}{t^2} \rightarrow \boxed{h = \frac{1}{4t^2}}$$

$$.062 = \frac{K}{(5)^2}$$

$$K = .25 \text{ or } \frac{1}{4}$$

$$-\frac{1}{108} = \frac{1}{4t^2}$$

$$\frac{-4t^2}{-4} = \frac{108}{-4}$$

$$t^2 = -27$$

$$\sqrt[2]{t^2} = \sqrt[2]{-27}$$

$$\boxed{t = -3}$$

$$21) \text{ For 2 us } \rightarrow \frac{\text{cost}}{\text{sec}} = \frac{2,000,000}{30} = 66,666.67 \text{ per second}$$

$$\text{For 1967} \rightarrow 20.989 \text{ min} \\ \times 60 = 1259.34 \text{ seconds.}$$

$$\frac{\text{cost}}{\text{sec}} = \frac{2,000,000}{1259.34} = 1588.133467 \text{ per second.}$$

$$(1, 1588.133467) \text{ and } (35, 66,666.67)$$

$$Y = 1588.133467 X^p$$

$$\frac{66,666.67}{1588.133467} = \frac{1588.133467 \cdot 35^p}{1588.133467}$$

$$\frac{\log 41.97800209}{\log 35} = \frac{p \log 35}{\log 35}$$

$$p = 1.0511$$

$$\boxed{Y = 1588.13467 X^{1.0511}}$$

$$22) \text{ on earth } \rightarrow 180 = \frac{K}{d^2}$$

$$K = 180d^2$$

$$\text{On other planet } \rightarrow W = \frac{K}{(3d)^2}$$

$$K = 9Wd^2$$

$$\frac{180d^2}{9d^2} = \frac{9Wd^2}{9d^2}$$

$$20 = W \text{ so } \boxed{20.165}$$