Algebra 3.9 Variations

Variation - describes relationships between 2 or more variables
K - constant of proportionality

Direct variation - $y = Kx$ ex $d = rt$ time incr, distance incr
Indirect variation - $y = \frac{K}{x}$ ex $P = \frac{K}{V}$ pressure ↑, volume ↓

Express a statement as a formula that involves u, v, and a constant of proportionality. Also determine the value of K.

1) u is directly proportional to v, and if $v = 9$, $u = 18$
$u = Kv$ $18 = K \cdot 9$ $K = 2$ $\boxed{u = 2v}$

2) u is indirectly proportional to v, and $v = 2$, $u = 7$
$u = \frac{K}{v}$ $7 = \frac{K}{2}$ $K = 14$ $\boxed{u = \frac{14}{v}}$

3) r varies directly with s, & indirectly with the square of t
$r = \frac{Ks}{t^2}$ $3 = \frac{K \cdot 16}{4^2}$ $3 = \frac{16K}{16}$ $K = 3$ $\boxed{r = \frac{3s}{t^2}}$

4.) r varies directly with the square root of s, and indirectly with the sum of s & t, find K, $r = 10$, $s = 4$, $t = 8$
$r = \frac{K\sqrt{s}}{s+t}$ $10 = \frac{K\sqrt{4}}{4+8}$ $10 = \frac{2K}{12}$ $K = 60$ $\boxed{r = \frac{60\sqrt{s}}{s+t}}$

5.) r varies directly with the opposite of t and indirectly with the difference of s & t, $r = -5$, $s = 2$, $t = -10$
$r = -\frac{Kt}{s-t}$ $-5 = \frac{-K(-10)}{2-(-10)}$ $-5 = \frac{10K}{12}$ $K = -6$ $\boxed{r = \frac{6K}{s-t}}$

6.) r varies directly w/ the square of the sum of s & t, and indirectly w/ the cube root of t. $r = 1$, $s = 5$, $t = -8$
$r = \frac{K(s+t)^2}{\sqrt[3]{t}}$ $1 = \frac{K(5+-8)^2}{\sqrt[3]{-8}}$ $1 = \frac{9K}{-2}$ $K = -\frac{2}{9}$