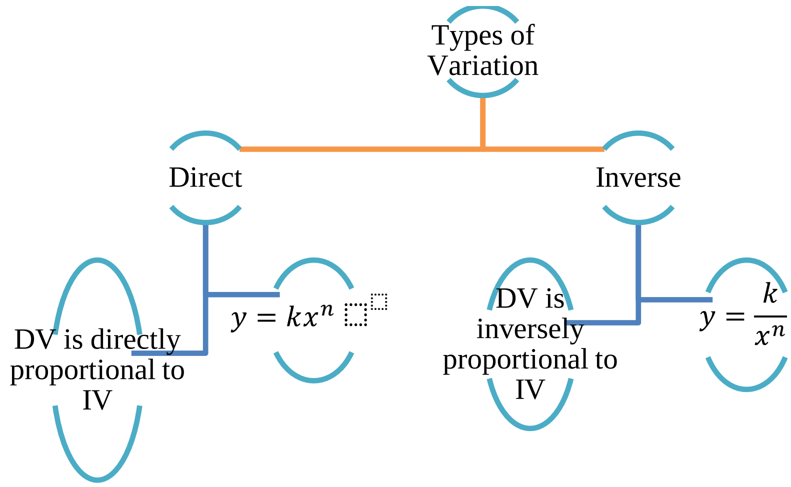
Precalculus Variation Notes

A <u>power function</u> has the form $f(x) = k \cdot x^a$, where k and a are non-zero constants.

The constant a is ___________________ and the constant k is the __________________________________.

The function *f(x)* **varies as (or is proportional to)** the *a*th power of *x*.



Is the following an example of direct variation, inverse variation, or neither?

- The volume of a cylinder of height 10 cm varies ______________ as the square of its radius
- Your distance above ground while on a Ferris wheel varies _____________ as the number of minutes you have been on the ride.
- The number of people invited to dinner varies _______________ as the amount of space each person has at the table.

Ex: The power *P* (in watts) produced by a windmill is proportional to the cube of the wind speed *v* (in mph). If a wind of 10 mph generates 15 watts of power, how much power is generated by winds of 80 mph?

Precalculus Variation Notes

Ex: Boyle's Law state that the volume of an enclosed gas (at a constant temperature) varies inversely as the pressure. If the pressure of a 3.46-L sample of neon gas at a temperature of 302 K is 0.926 atm (standard atmosphere), what would the volume be at a pressure of 1.452 atm if the temperature does not change?

When multiple IV affect the outcome of a DV in a variation situation, we have **joint variation or **combined variation**. Joint variation occurs when multiple IV are directly proportional. Combined variation occurs when there is both a direct variation and an inverse variation relationship amongst the IV.

Ex: An object is tied to a string and then twirled in a circular motion. The tension in the string varies directly as the square of the speed and inversely as the radius of the circle. When the radius is 5 ft and the speed is 4 ft/sec, then the tension in the string is 90 lb. If the radius is 3ft and the speed is 4.4 ft/sec, find the tension in the string.

Ex: The force needed to keep a car from skidding on a curve varies directly as the weight of the car and the square of the speed and inversely as the radius of the curve. It requires 266 lb of force to keep a 2200-lb car, traveling at 30 mph, from skidding on a curve of radius 500 ft. How much force is required to keep a 3000-lb car, traveling 45 mph, from skidding on a curve of radius 400 ft?