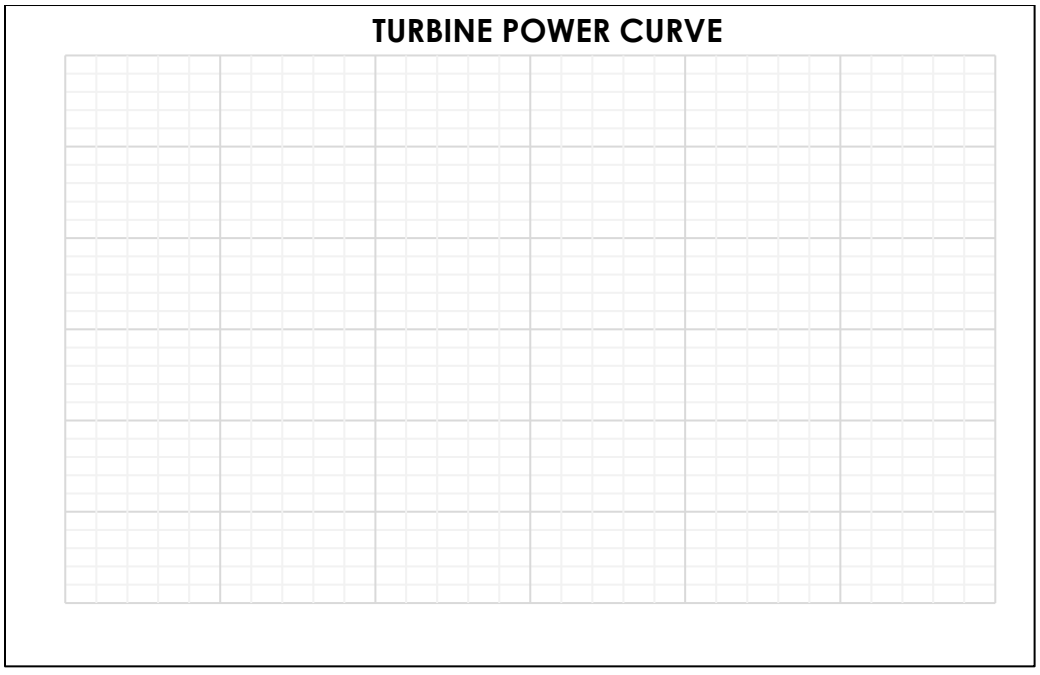
2021Q5 (GRAPHING, FUNCTIONS)

The power produced by any wind turbine is given by the turbine's power curve. The power curve gives the power produced at any wind speed. Power curves are governed by the design of the turbine and are calculated by the manufacturer.

Level 1: A section of a wind turbine's power curve is below.

TURBINE POWER CURVE	
WIND SPEED (m/s)	**POWER (kW)**
3.0	5
3.5	14
4.0	35
4.5	60
5.0	105
5.5	155
6.0	210
6.5	269
7.0	340
7.5	420
8.0	520
8.5	625
9.0	750
9.5	900
10.0	1,045

Plot the power curve on the graph below. Label the axes appropriately.



Level 2: The equation to calculate the power produced at a given wind speed is shown below:

$$P = C_p * \rho * A * V^3$$

Where P is power in W, C_p is the power coefficient, ρ is the air density in kg/m^3, A is the rotor swept area in m^2, and V is the wind speed in m/s. If a wind turbine with a rotor diameter of 93 m is producing 850kW, the air density is 1.2 kg/m^3, and the power coefficient is 0.3, what is the current wind speed? Which variable has the largest influence on the power equation?

Multiple turbines can be seen in this photo. The different turbine models have different power curves.