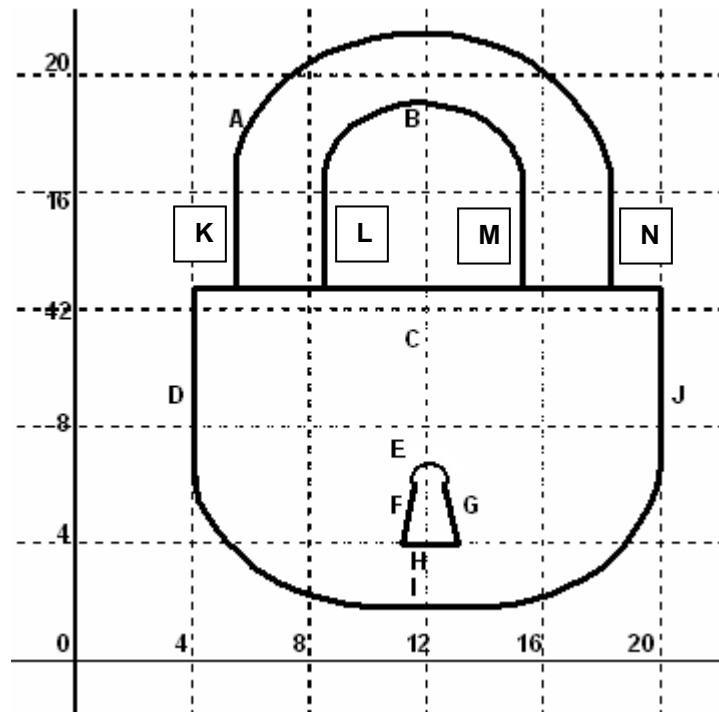


Requirements for Modeling Project:

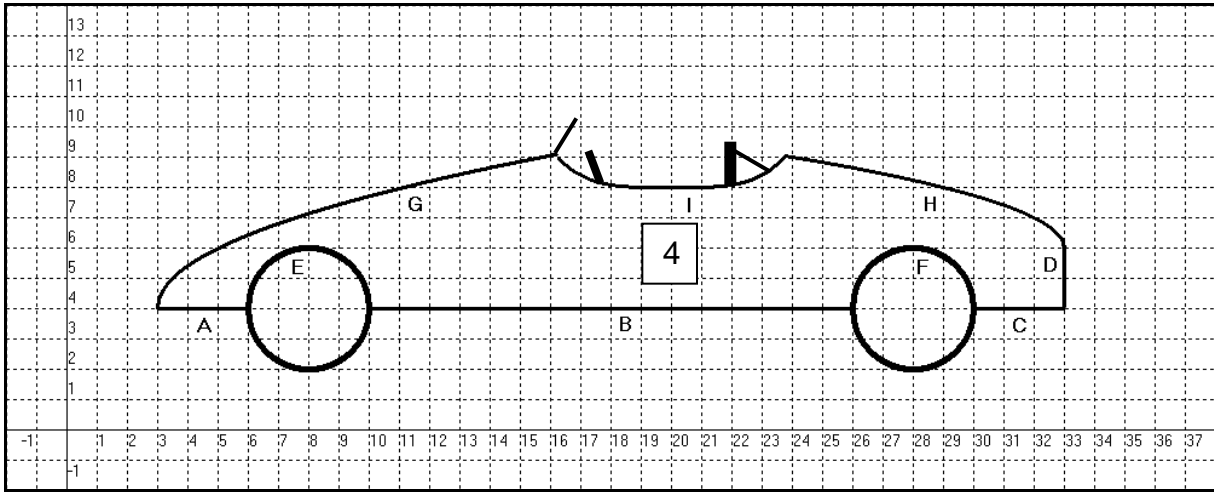
1. Construct equations to describe the labeled line segments. The equations may be linear or nonlinear. Use shifting and transformations to match the equations to the graph of the model
2. Use interval notation to state the domain and range for each equation.
3. Follow the padlock example to understand how to define equations that match the model.

MAC1105 Modeling Project: Padlock Example



<u>Line</u>	<u>Equation</u>	<u>Domain</u>	<u>Range</u>	<u>Standard Form</u>
A	$(X - 12)^2 + (Y - 16)^2 = 36$	[6,18]	[16,22]	$(X-h)^2 + (Y-k)^2=r^2$
B	$(X - 12)^2 + (Y - 16)^2 = 9$	[9,15]	[16,19]	$(X-h)^2 + (Y-k)^2=r^2$
C	$Y = 13$	[4,20]	{13}	$Y = mx + b$
D	$X = 4$	{4}	[6,13]	$X = a$
E	$(X - 12)^2 + (Y - 6)^2 = 1$	[11,13]	[6,7]	$(X-h)^2 + (Y-k)^2=r^2$
F	$Y = 2X - 18$	[11.5,12]	[4,6]	$Y = mx + b$
G	$Y = -2X + 30$	[12.5,13]	[4,6]	$Y = mx + b$
H	$Y = 4$	{4}	[11,13]	$Y = mx + b$
I	$Y = .8(X - 12)^4 + 2$	[4,20]	[2,6]	$Y = a(x - h)^4 + k$
J	$X = 20$	{20}	[6,13]	$X = a$
K	$X = 6$	{6}	[13,16]	$X = a$
L	$X = 9$	{9}	[13,16]	$X = a$
M	$X = 15$	{15}	[13,16]	$X = a$
N	$X = 18$	{18}	[13,16]	$X = a$

Speed Track Race Car 4



Use the following table to record the equation, domain, and range for each line segment.

Line	Equation	Domain	Range	Form of Equation
A				$y = b$
B				$y = b$
C				$y = b$
D				$x = a$
E				$(x-h)^2+(y-k)^2=r^2$
F				$(x-h)^2+(y-k)^2=r^2$
G				$y = a\sqrt{x-h} + k$
H				$y = a\sqrt{h-x} + k$
I				$y = a(x-h)^4 + k$

Answer the following questions.

1) Depreciation: The Speed Track race car costs \$16,000 and depreciates to zero dollars in approximately eight years, depending on the depreciation equation.

Equation 1: $Y = -600x^2 + 2200x + 16000$

Equation 2: $Y = -2000x + 16000$

a) Identify each equation as linear or quadratic.

Equation 1: _____

Equation 2: _____

b) For each equation construct a table of values for $0 \leq x \leq 8$ and provide a sketch.

c) Which equation depreciates to zero faster? _____

2) Race car shock absorbers: The volume of gas in the shock absorber varies directly with the temperature of the gas and inversely with the amount of weight on the shock. If the volume is 9 in^3 at 90°F with a weight of 450 lb, then what is the volume at 110° with a weight of 500 lb?

3) Race car cooling system: The speed of the water pump pulley varies inversely as its diameter. A pulley with a diameter of 6 inches turns at 300 revolutions per minute. Find the speed of a similar pulley with a diameter of 5 inches.

If each rpm (revolutions per minute) pumps two ounces of coolant, compare the cooling capacity for each pulley.

Cooling capacity: Pulley with $d = 6$: _____

Pulley with $d = 5$: _____

Describe the differences in the cooling capacities.

4) Write at least a one page summary of what you have learned from this assignment. Explain in your own words how you approached this project. Describe how equations and transformations are used to create a model and how domain and range adapt the equation to the model.