

**Guidelines for Solution;**

Examples of Polynomial Equations that match shapes:

Shape #1 -  $y = 0.1x^3 + 0.1x$

#2 -  $y = 3x^4 - 4x^3 - 12x^2$

#3 -  $y = 3x^5 - 5x^3$

#4 -  $y = 2x^3 - 5x$

#5 -  $y = -5x^4 + 8x^2$

#6 -  $y = 3x^4 - 8x^3 + 6x^2$

# Polynomials by Design

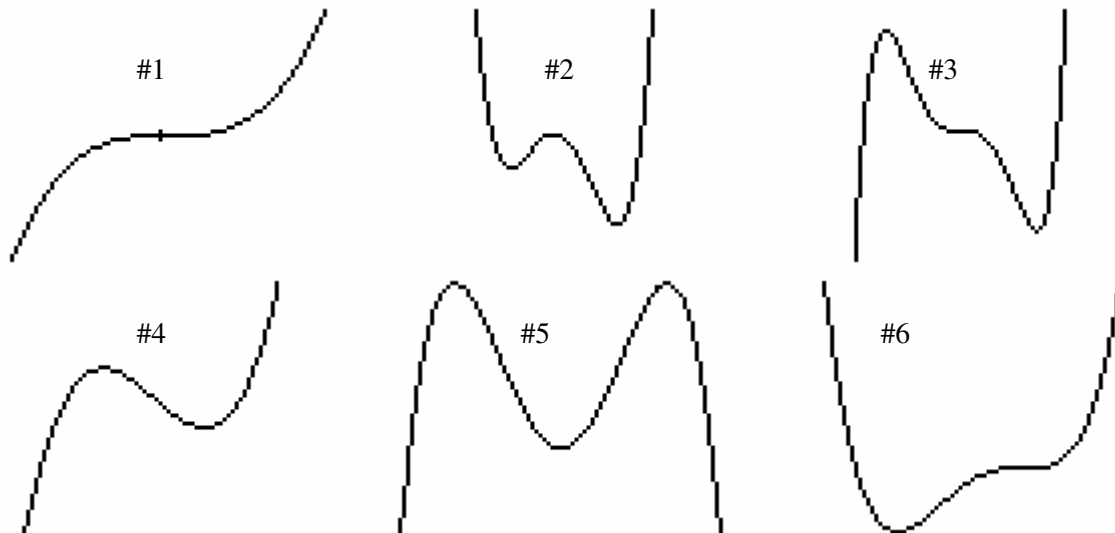
## Summative Assessment

Designers use polynomial functions to model the sleek lines of automobiles. The smooth curves of polynomials approximate the shapes that the designer is trying to achieve. Designers must be able to adjust the polynomials to accommodate modifications to their plans. As well, they must be able to verify the properties of these functions.

Below are 6 different shapes required in a design.

- A) Choose one of the shapes.  
Create an equation of a polynomial function that would model this shape.  
Use your knowledge of odd/even/neither functions and graphs.  
Use the TI-83 to help you provide a sketch that illustrates the overall shape of your function.  
Describe the process you used to determine your equation.
- B) For your polynomial function, calculate and verify the properties listed below.  
Y Intercept  
Domain  
Critical Points (Classified)  
Points of Inflection (Verified)  
Intervals of Concavity
- C) Make a well-labeled sketch of your function on the XY plane to illustrate its properties.

SHAPES TO CHOOSE FROM:



## Using Polynomials in Design – Assessment Rubric

|  | Level 1  | Level 2   | Level 3   | Level 4   |
|--|--|---|---|---|
| <b>Thinking, Inquiry, and Problem Solving</b>  |  |   |   |   |
| Justification of reasoning in explanations of how equation was determined #1             | Reasoning is evident but lacks consistency                       | Reasoning is evident and logical in parts of the problem            | Reasoning is logical and consistent within context                                  | Reasoning is logical and consistent and relates to broader context      |
| <b>Application</b>   |  |   |   |   |
| Application of Calculus Techniques to determine properties of the polynomial function #2 | Attempted solution applies few calculus techniques with accuracy | Solution applies some calculus techniques with errors and omissions | Solution applies sufficient calculus techniques with only minor errors or omissions | Detailed solution thoroughly and accurately applies calculus techniques |