Polynomial Function Graphs Revisited
or
"Some thought-provoking questions about the graphs of polynomials."

Engagement Activity for Section 3.1 of Precalculus, Third Edition, Stitz and Zeager

Primary Section: 3.1
Secondary Sections: 1.6
Key Concepts: Graphs of polynomial functions

This activity is designed to get you to more thoroughly discuss the concepts presented in Section 3.1 of the textbook with a small group of your classmates. It is not a replacement for the regular homework, but rather, is a deeper investigation into the material presented in the section and how it is connected to other material presented in other sections. Your professor will have specific instructions as to how he/she wants the activity to fit into the class so please pay attention in class when this activity is assigned.

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Work with a small group of your classmates to answer the following questions. You may need to provide graphical examples or counter-examples, perhaps even write a sentence or two, in order to fully explain your answer. Play around and have some fun!

1. How few local extrema could a polynomial of degree n have? (Hint: Think about even and odd degrees separately.)

2. Could a polynomial have two local maxima but no local minima?

3. If a polynomial has two local maxima and two local minima, can it be of odd degree? Can it be of even degree?

4. Can a polynomial have local extrema without having any real zeros? (Hint: Think about shifting the graph up several units.)

5. Why must every polynomial of odd degree have at least one real zero? (Hint: There's a named theorem for this one.)

6. Can a polynomial have two distinct real zeros and no local extrema? (Hint: Think about how real zeros are related to x-intercepts.)

7. Can an x-intercept yield a local extrema? Can it yield an absolute extrema?

8. If the y-intercept yields an absolute minimum, what can we say about the degree of the polynomial and the sign of the leading coefficient?

9. How many local extrema could a polynomial of degree n have? (The formal proof of the answer to this requires Calculus so don't be discouraged if you struggle with this one. The struggle is the important learning device, here, so please think deeply about this question.)

Student Questionnaire for
Polynomial Function Graphs Revisited

This Engagement Activity was created with one purpose in mind - to help you the student better understand the concepts presented in College Algebra. Whereas *we* think the activity does its job, the truth is that we need to know from you if it actually helped you learn. Please take a few minutes to complete this questionnaire anonymously and return it to your instructor. Your feedback will be used to improve the activity for next semester.

1. For Questions 1a through 1e below, please place an X in the box which most closely matches your opinion.

   (a) Before I began the activity, my understanding of the material was best described as

Clueless	Not so good	Meh	Pretty good	I pwned it!

   (b) After completing the activity, my understanding of the material is best described as

Clueless	Not so good	Meh	Pretty good	I pwn it!

   (c) The connection between the activity and the course material was clear

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

   (d) The activity's instructions were clear

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

   (e) The activity was a good use of class time

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. What did you like about the activity?

Continued on back $\longrightarrow$

3. How can we improve the activity?

4. Other comments: