**Activity 3.1.6 Polynomial Functions in Action**

Polynomial functions can be used to model practical applications when viewed in a restricted domain. For each of the following problems, create a graph of the function on a graphing utility and answer the questions. Use the grids provided to record the graph of the function given in the problem. Adjust the scale of the grid to provide a complete graph of the function over the effective domain of the function.

**From the Medical World: Lung Capacity**

The volume of air flowing into the lungs during a breath can be represented by the polynomial function V(t) = -0.041t3 + 0.181t2 + 0.202t, where V is the volume in litres and t is the time in seconds. Use a graphing calculator to graph V(t).

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| 1. What window displays a graph showing all the relevant features of the function?
2. What would you restrict your window to in order to show the domain and range appropriate to this application?
3. Draw the graph of the function in the appropriate window. Scale the graph according to the data.
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1. According to the graph, what is the duration of a single breath, that is, how long did it take to inhale and exhale all the air?
2. Using the ZERO feature of the calculator, determine the exact duration of one full breath.
3. Using the graph, estimate at what time during a single breath did the maximum volume of air enter the lungs?
4. Using the graph, estimate, what was the maximum amount of air in the lungs measured in liters during a single breath?
5. Using the MAXIMUM feature of the calculator, compute the exact time when the maximum amount of air was in the lungs and what the volume of air was at that time.

**From the Business World: Maximum Profit**

The profit, *P(n)* (in millions of dollars), for the production of *n* (in millions) MP3 players is given by the function *P(n) = -4n3 + 12n2 + 16n*.

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| 1. What would you restrict your window to in order to show the domain and range appropriate to this situation?
2. Draw the graph of the function in the appropriate window. Scale the graph according to the data.
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3. Using the graph, estimate at what level of production did the company start to lose money? Explain how you made that determination

4. Use the computation feature of the calculator to compute the exact level of production at what the company started to lose money.

5. Give a plausible reason why the profit would become negative after the level of production went above the level found in #4.

6. At what level of production should the company stop in order to ensure the greatest profit margin? Explain how you obtained your answer.

7. If the company predicted a profit of $60,000,000 to their shareholders, will they be able to satisfy their shareholders expectations?