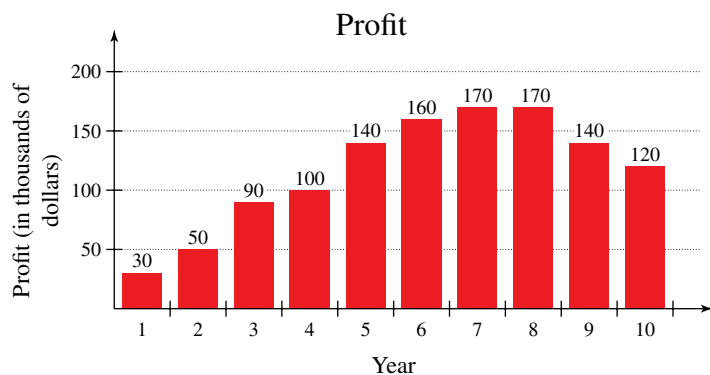


Collaborative Project – Limits and an Introduction to Calculus

The graph shows the profit that a new computer service business generates during its first 10 years of business.



- Let x represent the year.
 - Use the regression feature of a graphing utility to find a cubic function p for the profit.
 - Estimate the slope of the graph when $x = 4$ and when $x = 9$ and interpret the results.
 - Do you think the owners of the company feel more confident about the business in year 5 or year 8? Explain.
 - Find the derivative of the function. Use your answer to check the accuracy of your estimations in part (a).
 - Find the limit of the function as x approaches infinity and interpret the result. Is the result meaningful in this situation? Explain.
- The owners of the company want to increase their profit by a consistent amount every year or at least maintain a steady annual profit every year.
 - List some types of functions that approach a constant value or approach constant rate of change as x approaches infinity.
 - Suppose the company wants their profit to approach \$100,000 per year. Give an example of a rational function that has a limit of 100 as x approaches infinity. The function does not need to actually model the profit.
 - Suppose the company wants their profit to approach an increase of 10% every year. Give an example of a rational function that approaches the line $y = 1.1x$ as x approaches infinity. The function does not need to actually model the profit. Does the function have a limit as x approaches infinity?
- Approximate the total profit by finding the area of each region.
 - The region bounded by the graph of the function p in Exercise 1, the x -axis, and the lines $x = 0$ and $x = 10$.
 - The region bounded by the graph of the function p , the x -axis, and the lines $x = 0.5$ and $x = 10.5$.

Which approximation is better? Explain.