Newton's Method

Learning Objectives

- Use Newton's Method to approximate the root of a polynomial

- Use Newton's Method to approximate a square root

- Determine when Newton's Method does not work

Use Newton's Method to approximate the root of a polynomial

1. The polynomial $p(x) = x^3 - 5x + 11$ has one real solution near $x = -3$. Beginning with that value, use Newton's method to find the value of the root to two decimal places.

Use Newton's Method to approximate a square root

2. Use Newton's method to find the value of $\sqrt{11}$ by finding the root of $f(x) = x^2 - 11$. Round your answer to three decimal places.

Determine when Newton's Method does not work

3. In Problem #2, explain why we cannot use Newton's method to estimate the value of the square root if we begin our guessing at $x = 0$?

- $x_{n+1} = x_n - \dfrac{f(x_n)}{f'(x_n)}$
- Both $f'(x_n) \neq 0$, and $\dfrac{f(x_n)}{f'(x_n)}$ must be defined.

ANSWER KEY

1. $x \approx -2.95$

2. $\sqrt{11} \approx 3.3166$

3. $x = 0$ will not work because $f'(0) = 0$, and so the expression $\frac{f(x)}{f'(x)}$ will be undefined