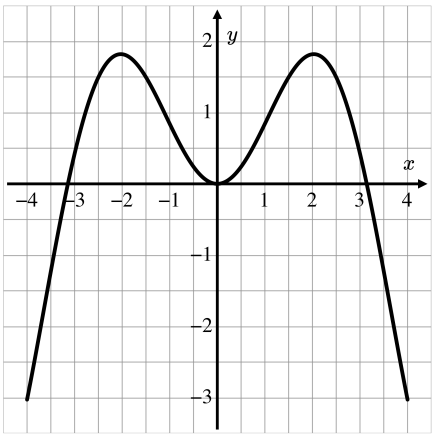
Mean Value Theorem

1. Consider the following graph of $f(x) = x\sin(x)$ on the domain $[-3, 3]$.



   (a) How many values of c in $(-3, 3)$ appear to satisfy the Mean Value Theorem equation $f'(c) = \dfrac{f(b) - f(a)}{b - a}$ where $a = -3$ and $b = 3$.

   (b) How many values of c in $(-3, 3)$ appear to satisfy the Mean Value Theorem equation $f'(c) = \dfrac{f(b) - f(a)}{b - a}$ where $a = -4$ and $b = 2$.

   (c) How many values of c in $(-3, 3)$ appear to satisfy the Mean Value Theorem equation $f'(c) = \dfrac{f(b) - f(a)}{b - a}$ where $a = -2$ and $b = 3$.

2. Suppose that f is continuous and differentiable on the interval $[3,\ 8]$. Also suppose that $f(3) = 2$ and $f'(x) \leq 2$ for all x in the interval $[3,\ 8]$. What is the largest possible value for $f(8)$? Justify your response.

3. In an ideal situation, the energy required to move an object with a uniformly applied force F across a distance D is $E = F \cdot D$. From rest, we know that a total of 70 Joules (the unit for energy) were expended to move the box a total of 5 ft. How much force must have been exerted at least momentarily while the box was being pushed?

4. Suppose that g is continuous and differentiable on the interval $[2,\ 7]$. Also suppose that $f(2) = 10$ and $f'(x) \geq -2$ for all x in the interval $[2,\ 7]$. What is the smallest possible value for $g(7)$? Justify your response.