

1. Always, sometimes, or never: Explain. If $f(x)$ and $g(x)$ are increasing on an interval $[E, B]$ then $f(x) - g(x)$ is increasing on (E, B) . If sometimes, what other information would cause always, would cause never?
2. Always, sometimes, or never: Explain. If $f'(c) = 0$ there is an E, B with $E < c < B$ such that $f(E) = f(B)$. If sometimes, what other information would cause always, would cause never?
3. Suppose $f(0) = 0$ and $f'(x) \geq 2$. What is the smallest $f(4)$ can be if $f'(x)$ is differentiable everywhere? What is the largest? Answer these two again if instead you know $f'(x) \leq 2$.
4. Consider $f(x) = |x|$. Does there exist c in $(0, 2)$ such that $f'(c) = \frac{f(2)-f(0)}{2}$? What is happening here? Does this violate the MVT?
5. Use IVT to determine the intervals where $\sin x < x$ if $x < 0$.
6. Use IVT to determine the intervals where $\sin x > x$ if $x > 0$.
7. Use IVT to determine the intervals where $e^x > x$ if $x > 0$.
8. Use IVT to determine the intervals where $\sin x = -3x$ has exactly one solution.
9. Consider $f(x) = |x - 1|$. Does there exist c in $(0, 2)$ such that $f'(c) = \frac{f(2)-f(0)}{2}$? What is happening here?
10. Show that $\cos x = x^2$ has exactly 2 solutions.