

Assignment 9.

1. The derivative of a function gives the slope. The second derivative tells us if the slope increases or decreases. If a function has a critical point for which $f'(x) = 0$ and the second derivative is positive at this point, then f has minimum at this point. If the function has a critical point for which $f'(x) = 0$ and the second derivative is negative at this point, then f has maximum here.

Assignment 9

2.

$$f(x) = x\sqrt{x+3} ; [-3, 3]$$

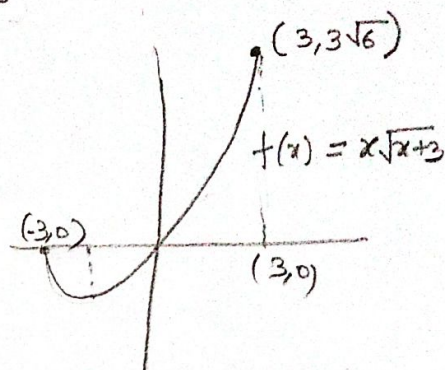
For critical points

$$f'(x) = \frac{d}{dx} (x(x+3)^{1/2}) = 0$$

$$\Rightarrow \sqrt{x+3} + \frac{x}{2\sqrt{x+3}} = 0$$

$$\frac{(3x+6)}{2\sqrt{x+6}} = 0$$

$$x = -2$$



$$f''(x) = \frac{3}{2\sqrt{x+6}} - \frac{6(x+2)}{(4x+24)^{3/2}}$$

$$= \frac{(6x+60)}{8(x+6)^{3/2}}$$

$$f''(x)|_{x=-2} = \frac{(-12+60)}{8(4)^{3/2}} = \frac{48}{8 \times 8} = \frac{6}{8} > 0$$

Thus, $x = -2$, is minimum.

Thus, as we know that $f(x)$ has an absolute minimum at $x = -2$, if $f(x) \geq f(-2)$ for every x in the domain $[-3, 3]$, $f(x) = x(x+3)^{1/2}$ is minimum (absolute) at $x = -2$. $f(x)$ has an absolute max at $x = 3$, in the domain $[-3, 3]$.

Absolute Minimum coordinate $(-2, -2)$

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Maximum

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$(3, 3\sqrt{6})$