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Quiz 9

MATH 200, Section 1
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1. Use either the first or second derivative test to find the local extrema of $f(x) = \frac{1}{3}x^3 - 2x^2 + 3x$.

$$f'(x) = x^2 - 4x + 3 = (x-1)(x-3) = 0$$

$\boxed{\text{Critical points: } x = 1 \quad x = 3}$

$$f''(x) = 2x - 4$$

$f''(1) = 2 \cdot 1 - 4 < 0$, so local max at $x = 1$

$f''(3) = 2 \cdot 3 - 4 > 0$, so local min at $x = 3$

Answer:
$f(x)$ has a local maximum of $f(1) = \frac{4}{3}$ at $x = 1$
$f(x)$ has a local minimum of $f(3) = 0$ at $x = 3$

2. Find the global extrema (i.e. absolute extrema) of $f(x) = 2\sqrt{x} - x$ on $(0, 4)$.

$$f(x) = 2x^{1/2} - x$$

$$f'(x) = x^{-1/2} - 1 = \frac{1}{\sqrt{x}} - 1$$

Undefined at $x=0$, but that critical point is not in the interval $(0,4)$

Solve $\frac{1}{\sqrt{x}} - 1 = 0$ to find any other critical points.

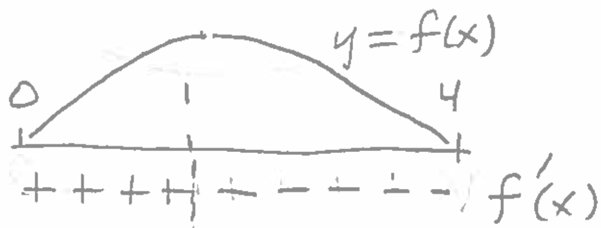
$$\frac{1}{\sqrt{x}} = 1$$

$$1 = \sqrt{x}$$

$$\boxed{x = 1}$$

critical point

test pt	$f'(x)$
$\frac{1}{4}$	$f'(\frac{1}{4}) = 1 > 0$
4	$f'(4) = -\frac{1}{2} < 0$



Answer: $f(x)$ has an absolute max of $f(1) = 1$ at $x = 1$
No abs. min on $(0, 4)$