

AB Calculus Ch. 3.6 Select HW Problems *Key*

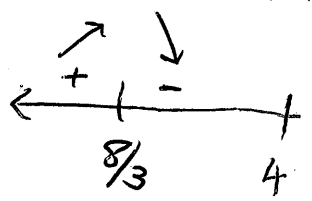
Analyzing the Graph of a Function In Exercises 5-24, analyze and sketch a graph of the function. Label any intercepts, relative extrema, points of inflection, and asymptotes. Use a graphing utility to verify your results.

15. $y = x\sqrt{4-x}$ Domain: $(-\infty, 4]$ x -int: $(0, 0)$ $(4, 0)$

$$y = x(4-x)^{1/2}$$

$$y' = 1 \cdot (4-x)^{1/2} + x \cdot \frac{1}{2}(4-x)^{-1/2}(-1)$$

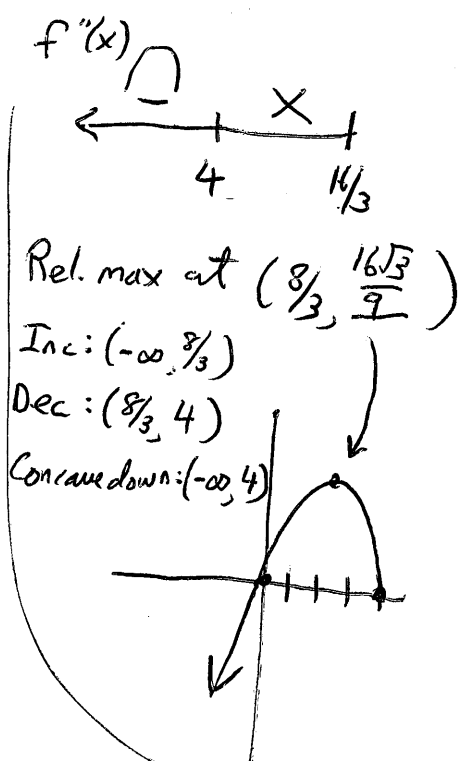
$$y' = \sqrt{4-x} - \frac{x}{2\sqrt{4-x}} = \frac{2(4-x) - x}{2\sqrt{4-x}} = \frac{8-3x}{2\sqrt{4-x}}, \quad x = 8/3$$



$$y'' = \frac{-3 \cdot 2\sqrt{4-x} - (8-3x) \cdot 2 \cdot \frac{1}{2}(4-x)^{-1/2}(-1)}{(2\sqrt{4-x})^2}$$

$$y'' = \frac{-6\sqrt{4-x} - \frac{8-3x}{\sqrt{4-x}}}{4(4-x)} \cdot \frac{\sqrt{4-x}}{\sqrt{4-x}} = \frac{-24 + 6x + 8 - 3x}{4(4-x)^{3/2}} = \frac{3x-16}{4(4-x)^{3/2}}, \quad x = 16/3$$

$x = 16/3$
not in domain



23. $y = x^5 - 5x$ x -ints: $(-\sqrt{5}, 0)$ $(\sqrt{5}, 0)$

$$y' = 5x^4 - 5$$

$$y' = 5(x^4 - 1)$$

$$0 = 5(x^2 + 1)(x - 1)(x + 1)$$

$$x = 1, -1$$

A number line with tick marks at -1 and 1 . The region to the left of -1 is labeled with a plus sign (+) and an arrow pointing left. The region between -1 and 1 is labeled with a minus sign (-) and an arrow pointing right. The region to the right of 1 is labeled with a plus sign (+) and an arrow pointing left.

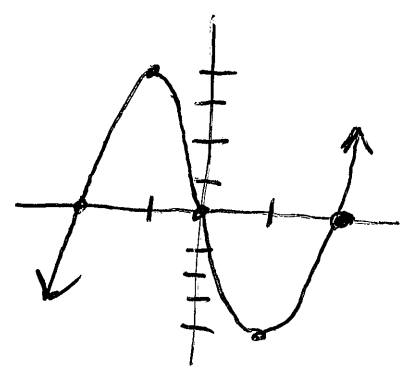
$$y'' = 20x^3 - 0$$

$$0 = 20x^3$$

$$x = 0$$

A number line with a tick mark at 0 . The region to the left of 0 is labeled with a minus sign (-) and an arrow pointing left. The region to the right of 0 is labeled with a plus sign (+) and an arrow pointing right.

POI: $(0, 0)$



concave up $(0, \infty)$
concave down $(-\infty, 0)$

Rel. max $(-1, 4)$ b/c $f'(x)$ changes from + to -
Rel. min $(1, -4)$ b/c $f'(x)$ changes from - to +
Inc: $(-\infty, -1) \cup (1, \infty)$ Dec: $(-1, 1)$

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