

1. critical points: $x = -2, 0, 2, 4$

$$\max = 10 \text{ at } x = 4$$

$$\min = 2 \text{ at } x = -2$$

3. critical points: $x = -2, -1, 0, 1, 2, 3, 4$

$$\max = 3 \text{ at } x = -2, 0, 2, 4$$

$$\min = 1 \text{ at } x = -1, 1, 3$$

$$5. f'(x) = 2x + 4 = 0 \Leftrightarrow x = -2$$

critical points are $x = -4, -2, 0$

$$\min \text{ is at } x = -2$$

$$\max \text{ is at } x = 0, -4 \text{ (same value)}$$

$$7. f'(x) = 2x + 3 = 0 \Leftrightarrow x = -\frac{3}{2}$$

critical pts. $x = -2, -\frac{3}{2}, -1$

$$\min \text{ at } x = -\frac{3}{2}$$

$$\max \text{ at } x = -2, -1 \text{ (same value)}$$

$$9. f'(x) = 3x^2 - 3 = 0 \Leftrightarrow x = \pm 1$$

$$f(-1) = 2 \quad f(1) = -2$$

$$f(3) = 18, \text{ so } 2 \text{ is not a max}$$

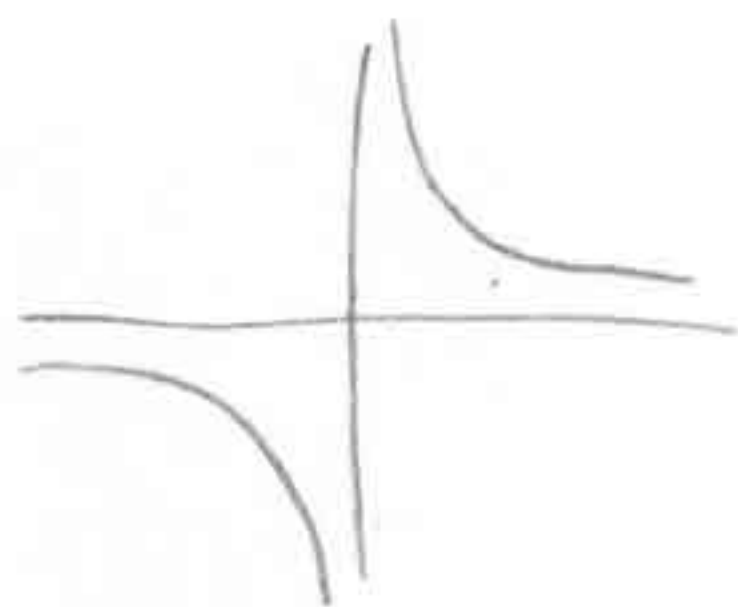
↑ not in interval, but as $x \rightarrow 3$,

$$f(x) \rightarrow f(3)$$

$$f(-\frac{3}{2}) = (-\frac{3}{2})^3 - \frac{9}{2} = -\frac{27}{8} - \frac{9}{2} < -2$$

so -2 is not a min.

11. No max or min. h is not cont. and undefined at $x=0$



13. $f'(x) = 4x^3 - 4x = 0 \iff x = \pm 1, 0$

$$f(-2) = f(2) = 10$$

$$f(-1) = f(1) = 1$$

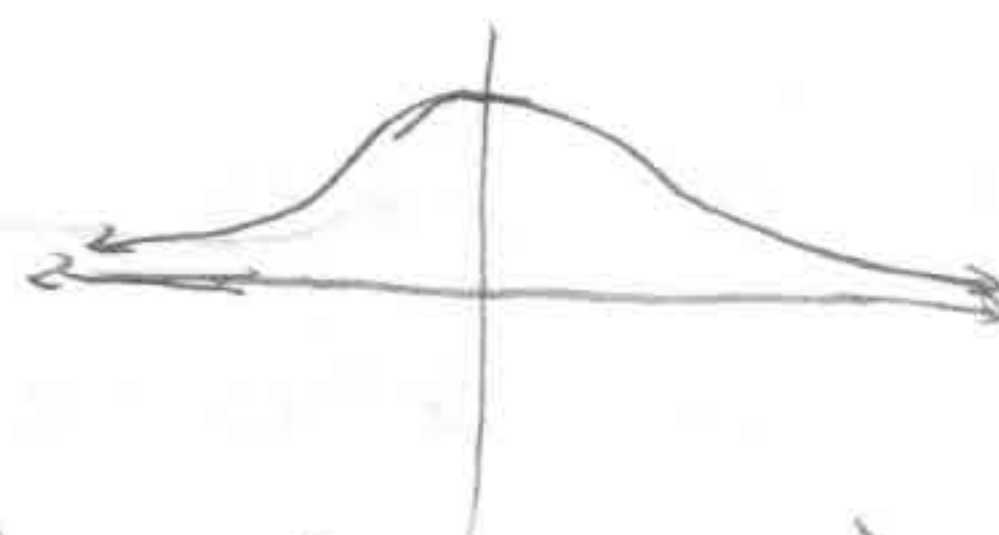
$$f(0) = 2$$

max: 10 at $x = \pm 2$

min: 1 at $x = \pm 1$

15. $f(x) = \frac{1}{1+x^2}$ no min

but f is always > 0



max occurs when denom is smallest (at $x=0$)

17. $f'(\theta) = \cos \theta$ has no zeroes on $[-\pi/4, \pi/6]$

critical pts: $x = -\pi/4, \pi/6$

min at $x = -\pi/4$, max at $x = \pi/6$

19. $f'(x) = \begin{cases} -1 & x < 1 \\ 1 & x > 1 \end{cases}$ is never zero

critical pts: $x = 0, 1, 3$

min at $x = 1$, max at $x = 3$

21. $g'(x) = \frac{1}{3} x^{-2/3}$ not defined at 0

critical points: $x = -1, 0, 27$

min at $x = -1$, max at $x = 27$

23. $H(t) = \cos t$, $H'(t) = -\sin t = 0 \Leftrightarrow t = 0, \pi, 2\pi, 3\pi, \dots, 8\pi$

critical pts: $t = 0, \pi, 2\pi, \dots, 7\pi, 8\pi$

Max of 1 at $t = 0, 2\pi, 4\pi, 6\pi, 8\pi$

min of -1 at $t = \pi, 3\pi, 5\pi, 7\pi$

27. $f(x) = x^3 - 6x^2 + x + 2$

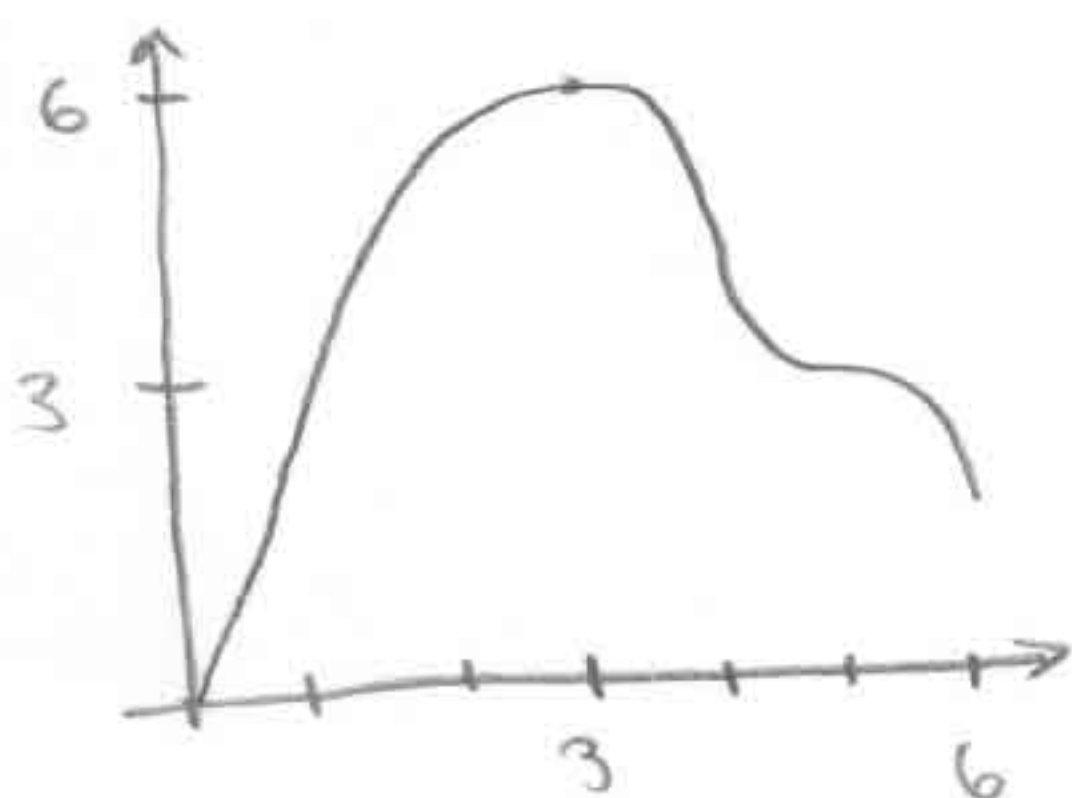
$f'(x) = 3x^2 - 12x + 1 = 0 \Leftrightarrow x = \frac{12 \pm \sqrt{144 - 12}}{6}$

critical pts: $x = -1, 5, 2 \pm \frac{\sqrt{132}}{6}$

max at $x = 2 - \frac{\sqrt{132}}{6}$

min at $x = 2 + \frac{\sqrt{132}}{6}$

29.



31.

