

4.4: 3, 7, 8, 11

4.5: (sample probs 1-7) 15, 16, 22, 28

4.8: (sample probs 1-5) 7, 14, 29, 33, 49

4.4 (Find the critical numbers of the following fns & classify the behavior of the fcn near those numbers)

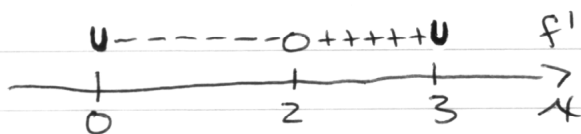
③ $f(x) = x^2 - 4x + 1$ for $x \in [0, 3]$

Critical #s:

① 0 & 3 (those x 's where f' is undefined; NB: f is undefined outside of $[0, 3]$)

② those x 's that make $f'(x) = 0$.

that is, those x 's that make $2x - 4 = 0 \Rightarrow x = 2$



Therefore f has a maximum at $x = 0$, a minimum at $x = 2$, and a maximum at $x = 3$. (At $x = 0$ & $x = 3$, note that f is defined (and continuous) there, so our conclusion is indeed the correct one.)

⑦ $f(x) = x^2 + 1/x$ for $x \in [1/10, 2]$

Critical #s:

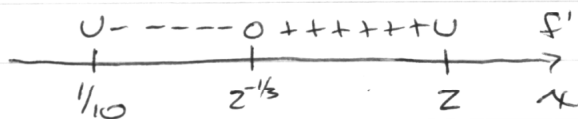
① $1/10$ & 2 (and no others; note: $x = 0$ is outside the domain)

② those x 's that make $2x - 1/x^2 = 0$

$$\Rightarrow \frac{1}{x^2} (2x^3 - 1) = 0 \quad (\text{if } x \neq 0)$$

$$\Rightarrow 2x^3 - 1 = 0 \quad (1/x^2 \text{ is never } 0)$$

$$\Rightarrow x = 2^{-1/3} (= 1/\sqrt[3]{2} \approx 0.8)$$



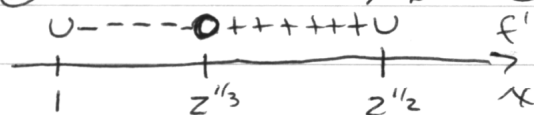
Therefore f has a maximum at $x = 1/10$, a minimum at $x = 2^{-1/3}$, and a maximum at $x = 2$.

⑧ $f(x) = x + 1/x^2$ for $x \in [1, \sqrt{2}]$

Critical #s

① $1 \leq \sqrt{2}$

② where $1 - 2/x^3 = 0 \Rightarrow x = 2^{1/3} (= \sqrt[3]{2})$



Therefore f has a maximum at $x=1$, a minimum at $x=2^{1/3}$, and a maximum at $x=2^{1/2}$.

① $f(x) = x/(4+x^2)$ for $x \in [-3, 1]$

Critical #s

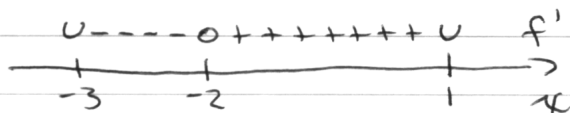
① $-3 \leq 1$ (f is otherwise defined, continuous, & differentiable; NB: $4+x^2$ is never 0)

② where $\frac{(1)(4+x^2) - (x)(2x)}{(4+x^2)^2} = 0$

$\Rightarrow 4+x^2 - 2x^2 = 0$ ($(4+x^2)^2$ is never 0)

$\Rightarrow x^2 = 4$

$\Rightarrow \underbrace{x = 2}_{\text{oops, } f \text{ isn't defined there}} \text{ or } x = -2$



There ~~for~~, f has a maximum at $x=-3$, a minimum at $x=-2$, and a maximum at $x=1$.