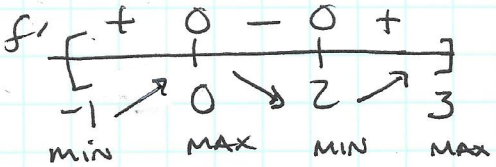
DAY 62 — §4.2 OPTIMIZATION. p. 202-204 #4, 6, 12, 14, 15 HW

(4) $f(x) = x^3 - 3x^2 + 20$ $[-1, 3]$

$f'(x) = 3x^2 - 6x = 0$

$3x(x-2) = 0$

$x = 0, 2$




TABLE

| x | −1 | 0 | 2 | 3 |
|---|---|---|---|---|
| y | 16 | 20 | 16 | 20 |

$f(-1) = f(2) = 16$ ABS. MIN on $[-1, 3]$

$f(3) = f(0) = 20$ ABS MAX. on $[-1, 3]$

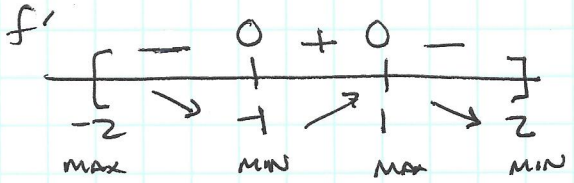
(6) $f(x) = xe^{\frac{-x^2}{2}}$ $[-2, 2]$

$f'(x) = 1\, e^{\frac{-x^2}{2}} + x(-x)e^{\frac{-x^2}{2}}$

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

$f'(x) = e^{\frac{-x^2}{2}}(1-x)(1+x) = 0$

$x = 1, -1$




TABLE

| x | −2 | −1 | 1 | 2 |
|---|---|---|---|---|
| y | $\frac{-2}{e^2}$ | $\frac{-1}{e^{1/2}}$ | $\frac{1}{e^{1/2}}$ | $\frac{2}{e^2}$ |
| | −.2707 | −.6065 | .6065 | .2707 |

$f(-2) = -.2707$ rel max

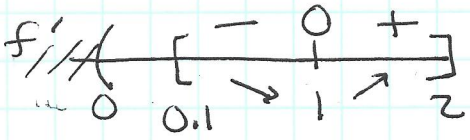
$f(-1) = -.6065$ ABS MIN

$f(1) = .6065$ ABS MAX

$f(2) = .2707$ rel min.

(12) $f(x) = x - \ln x$ $[0.1, 2]$

$f'(x) = 1 - \frac{1}{x} = \frac{x-1}{x} = 0$ @ $x = 1$ und @ $x = 0$




TABLE

| x | 0.1 | 1 | 2 |
|---|---|---|---|
| y | $\frac{1}{10} + \ln 10$ | 1 | $2 - \ln 2$ |
| | 2.4025 | | 1.3068 |

$f(1) = 1$ ABS MIN

$f(0.1) = 2.4025$ ABS max

$f(2) = 1.3068$ rel max.

DAY 62 § 4.2 p. 202 #14, 15 HW

(14) $g(x) = 4x - x^2 - 5$

$g(x) = -x^2 + 4x - 5$

$g'(x) = -2x + 4 = -2(x-2) = 0$

$x = 2$

$g'$ : + | 0 | − (↗ 2 ↘)

$g(x)$ has a global max of $y = 1$ $(2, g(2)) = (2, -1)$ b/c $g'$ changes signs ⊕ to ⊖

(15) $f(x) = x + \frac{1}{x}$ $x > 0$

$f'(x) = 1 - \frac{1}{x^2}$ $x > 0$

$f'(x) = \frac{x^2 - 1}{x^2} = \frac{(x-1)(x+1)}{x^2} = 0$ and

C.P. $\begin{cases} x = \pm 1 \\ x = 0 \end{cases}$

$f'$ : ~~+~~ | 0 | ~~+~~ | ∄ | − | 0 | + (↘ −1 ↗ 0 ↘ 1 ↗) for $x > 0$

$\therefore f(1) = 2$ is ABS MIN.