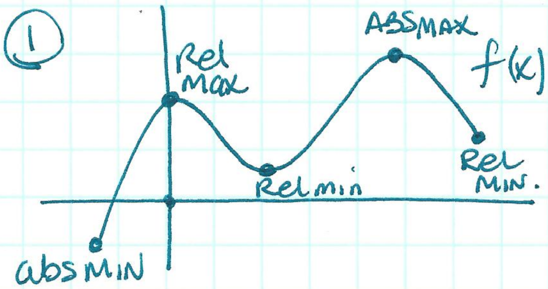
HW §4.1 USE 1ST & 2ND DERIVATIVES.

DAY 59 Pp 192–196 # 1–4, 9, 13, 31, 38, 43

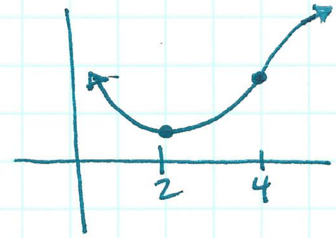
(1)



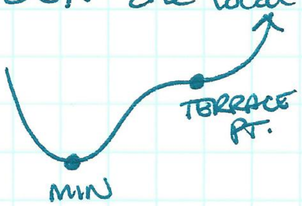
(2) C.P. @ x = 2

Inf. P. @ x = 4

Possible graph.



(3) 2 CP. one local min, one neither ∴ terrace



(4) $f(x) = x^3 - 9x^2 + 24x + 5$

$f'(x) = 3x^2 - 18x + 24$

$3(x^2 - 6x + 8)$

$3(x-4)(x-2) = 0$

CP: $x = 4$ $x = 2$

$f''(x) = 6x - 18 = 6(x-3) = 0$

I.P. $x = 3$ b/c f'' changes sign ⊖ to ⊕ @ $x = 3$.

(9) $f(x) = 3x^4 - 4x^3 + 6$

$f'(x) = 12x^3 - 12x^2$

$12x^2(x-1) = 0$

$x = 0$ $x = 1$

$f'(x)$: − 0 − 0 +

↘ 0 ↘ 1 ↗

TERRACE PT REL MIN

$f''(x) = 36x^2 - 24x$

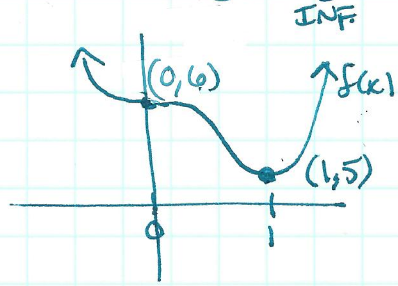
$12x(3x - 2) = 0$

$x = 0$ $x = 2/3$

$f''(x)$: + 0 − 0 +

∪ 0 ∩ 2/3 ∪

INF



$f(x)$ decreasing $(-\infty, 0)\ (0, 1)$

∴ $(1, f(1))$ is neither max nor min but a terrace pt.

$f(1) = 5$ Rel min ABS min

b/c f' changes sign ⊖ to ⊕ at $x = 1$

& $f''(1) < 0$

(13) $g(x) = xe^{-3x}$

$g'(x) = 1(e^{-3x}) + x(-3e^{-3x})$

$g'(x) = (e^{-3x})(1 - 3x) = 0$

never = 0 always > 0 $x = 1/3$

$g'(x)$: + 0 −

↗ 1/3 ↘

$g(1/3) = \frac{1}{3e}$ is an ABS MAX REL MAX b/c g' changes sign ⊕ to ⊖.

(31) use table

a) x-coord of critical pts f':

$x = 2.5$ on $(2, 3)$ b/c ⊕ 0 ⊖

$x = 6.5$ on $(6, 7)$ b/c f' ⊖ 0 ⊕

$x = 9.5$ on $(9, 10)$ b/c f' ⊕ 0 ⊖

$x = 2.5$ Rel MAX f' ⊕ to ⊖

$x = 6.5$ Rel MIN f' ⊖ to ⊕

$x = 9.5$ Rel MAX f' ⊕ to ⊖.

HW §4.1 $\boxed{\text{DAY 59}}$ pp 192–196 # 38, 43

(38) $f(x) = x^2 + ax + b$ and has a local minimum $(6, -5)$

$f'(x) = 2x + a \qquad f'(6) = 0 \qquad \therefore\ 2(6) + a = 0$

$a = -12$

$\therefore\ f(x) = x^2 - 12x + b$ & $(6, -5)$ on $f(x)$

$36 - 72 + b = -5$

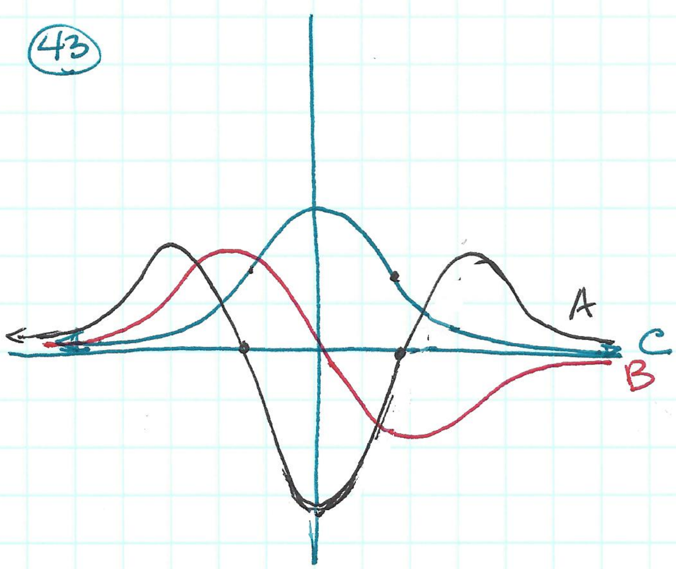
$\therefore\ b = 31$

complete the square

$f(x) = x^2 - 12x + 31 = (x-6)^2 + 31 - 36$

$= (x-6)^2 - 5 \qquad V(6, -5)$ ✓

(43)



$f(x) = C$

$f'(x) = B$

$f''(x) = A$