ex 6 $f(x) = 2x^3 - 3x^2 - 12x + 5$
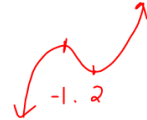
$f'(x) = 6x^2 - 6x - 12$

$0 = 6(x^2 - x - 2)$

$0 = 6(x-2)(x+1)$

$x = 2, -1$

↓   ↑
local   local max
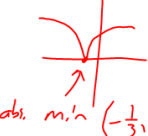min

ex.7 $f(x) = (3x+1)^{2/3} = \sqrt[3]{(3x+1)^2}$

$f'(x) = \frac{2}{3}(3x+1)^{-1/3}(3) = \frac{2}{(3x+1)^{1/3}}$

abs. min $\left(-\frac{1}{3}, 0\right)$

$3x + 1 = 0$

$x = -\frac{1}{3}$ critical number

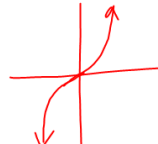$f'(x)$ undefined at $x = -\frac{1}{3}$

ex.8 $f(x) = x^3$

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

$3x^2 = 0$

$x = 0$ critical number

ex.9 $f(x) = x^{1/3} = \sqrt[3]{x}$

$f'(x) = \frac{1}{3}x^{-2/3} = \frac{1}{3x^{2/3}}$

$3x^{2/3} = 0$

$x = 0$ critical number

$f'(0)$ is undefined

(ex.10) $f(x) = \dfrac{2x^2}{x+2}$, $x \neq -2$

$f'(x) = \dfrac{4x(x+2) - 2x^2(1)}{(x+2)^2} = \dfrac{2x^2 + 8x}{(x+2)^2}$

$f'(x) = \dfrac{2x(x+4)}{(x+2)^2}$

$0 = 2x(x+4)$ $x+2 = 0$

crit. #s $x = 0, -4$ $x = -2$ not in the domain
                                              so no critical #

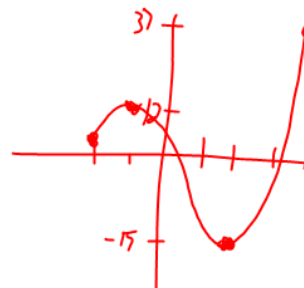---

(ex.11) $f(x) = 2x^3 - 3x^2 - 12x + 5$ on $[-2, 4]$

$f'(x) = 6x^2 - 6x - 12$

$6x^2 - 6x - 12 = 0$
$6(x^2 - x - 2) = 0$
$6(x-2)(x+1) = 0$
crit # at $x = 2, -1$

$f(2) = -15$ abs. min $f(-2) = 1$
$f(-1) = 12$ $f(4) = 37$ abs. max.

ex. 12

$f(x) = 4x^{5/4} - 8x^{1/4}$ on $[0, 4]$

$f'(x) = 5x^{1/4} - 2x^{-3/4} = \dfrac{x^{3/4}}{x^{3/4}} \dfrac{5x^{1/4}}{1} - \dfrac{2}{x^{3/4}}$

$f'(x) = \dfrac{5x - 2}{x^{3/4}}$

$f(0) = 0$

crit #'s: $x = 0$ $x = \dfrac{2}{5}$

$f\left(\dfrac{2}{5}\right) \approx -5.0897$ abs. min

$f(4) \approx 11.3137$ abs. max

ex. 13

$f(x) = x^3 - 5x + 3\sin x^2$ $[-2, 2.5]$

$f'(x) = 3x^2 - 5 + 3\cos x^2 (2x)$

$f'(x) = 3x^2 - 5 + 6x \cos x^2$

crit. #'s

$f(\quad)$

$f(\quad)$

$f(\quad)$

$f(\quad)$

$f(-2) =$

$f(2.5) =$