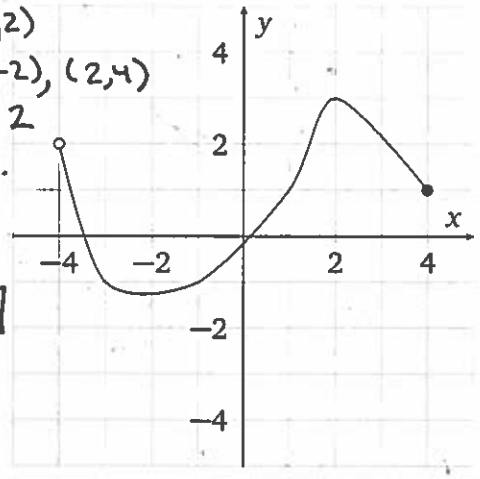
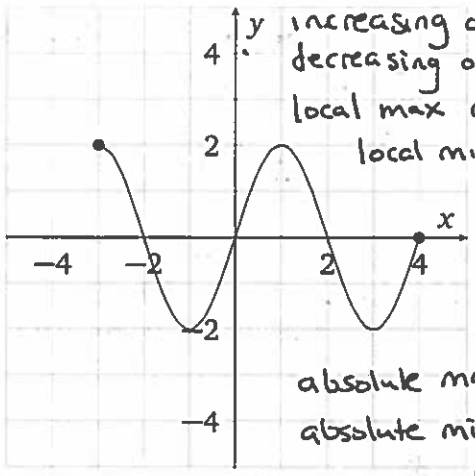
Increasing and Decreasing Intervals

1. For each function plotted, identify the interval(s) where it is increasing, the interval(s) where it is decreasing, all local maxima, all local minima, all absolute maxima, all absolute minima, and the range.

increasing on (-2,2)
decreasing on (-4,-2), (2,4)
local maximum at 2
local min at -2, 4.
absolute max at 2
absolute min at -2
range is [-1.2, 3]



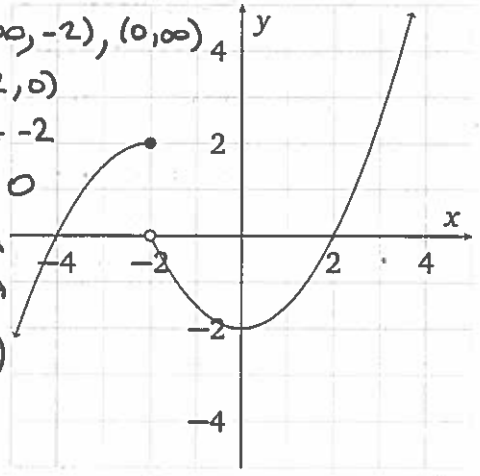
a)



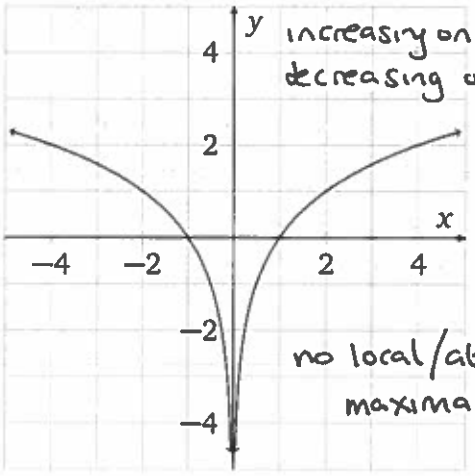
b)

increasing on (-1,1), (3,4)
decreasing on (-3,-1), (1,3)
local max at -3, 1, 4
local min at -1, 3
absolute max at -3, 1
absolute min at -1, 3
range is [-2,2]

increasing on (-∞,-2), (0,∞)
decreasing on (-2,0)
local maximum at -2
local minimum at 0
no absolute maxima
no absolute minima
range = (-∞, ∞)



c)

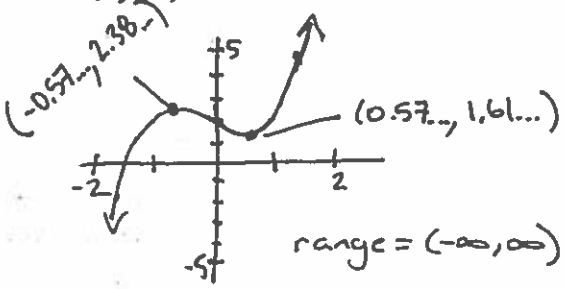


d)

increasing on (0,∞)
decreasing on (-∞, 0)
no local/absolute maxima/minima.
range = (-∞, ∞)

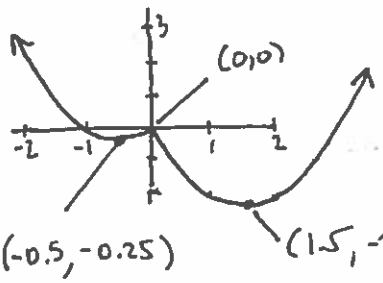
2. Use your graphing calculator to determine where each function is increasing, where it is decreasing, all local maxima, all local minima, all absolute maxima, all absolute minima, and the range. Sketch graphs here based on what you see in your calculator, and label coordinates of all important points.

a) $f(x) = x^3 - x + 2$



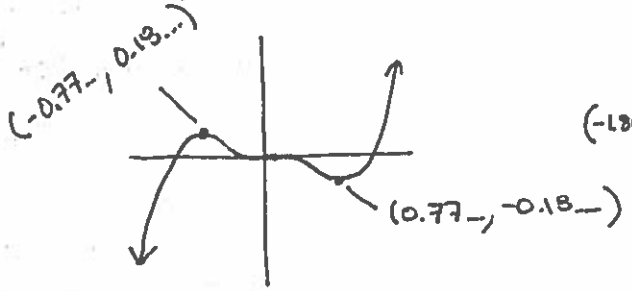
increasing on $(-\infty, -0.57...)$, $(0.57..., \infty)$
decreasing on $(-0.57..., 0.57...)$
local max at $-0.57...$ local min at $0.57...$
no absolute max, no absolute min.

b) $f(x) = x^2 - x - 2|x|$



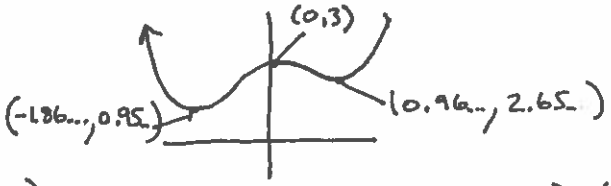
increasing on $(-0.5, 0)$, $(1.5, \infty)$
decreasing on $(-\infty, -0.5)$, $(0, 1.5)$
local max at 0; local min at -0.5, 1.5
no absolute max; absolute min at 1.5.
range = $[-2.25, \infty)$

c) $f(x) = x^5 - x^3$



increasing on $(-\infty, -0.77...)$, $(0.77..., \infty)$
decreasing on $(-0.77..., 0.77...)$
local max at $-0.77...$; local min at $0.77...$
no absolute max or min. range = $(-\infty, \infty)$

d) $f(x) = 0.25x^4 + 0.3x^3 - 0.9x^2 + 3$



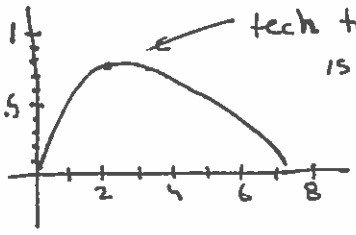
increasing on $(-1.86..., 0)$, $(0.96..., \infty)$
decreasing on $(-\infty, -1.86...)$, $(0, 0.96...)$
local max at 0; local min at $-1.86...$, $0.96...$
no absolute max,
absolute min at $-1.86...$
range = $[0.95..., \infty)$

3. The concentration C of a medication in the bloodstream t hours after being administered is modeled by the function

$$C(t) = -0.002t^4 + 0.039t^3 - 0.285t^2 + 0.766t + 0.085$$

When will the concentration be highest?

Plotting $y = C(x)$, we see:



tech tools say peak is at (2.16..., 0.759...)

So after 2.16 hrs the concentration reaches its peak of 0.759.