

1/19/ Calc 1 : Functions + graphs

x/y intercepts  
domain

P. 3

Straight lines

lines: slope

slope - intercept formula

point - slope formula

// lines

⊥ lines

Vertical lines

$x = 3$

$m = \text{undefined}$



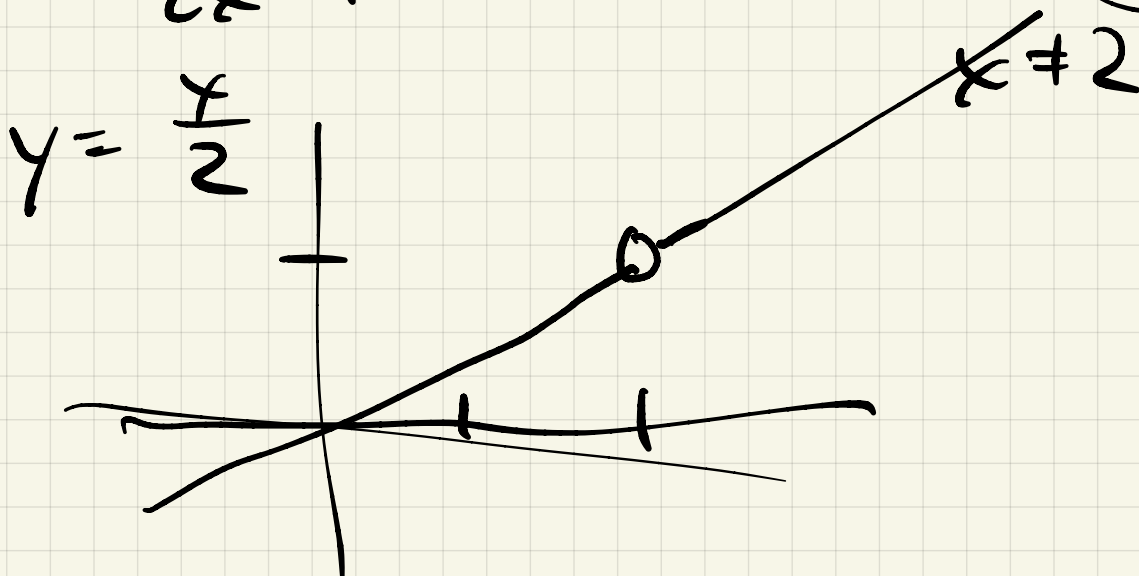
More complicated graphs :

(a) Find intercepts and domain, sketch

(a)  $y = \frac{x^2 - 2x}{2x - 4}$

Domain  $x \neq 2: (-\infty, 2) \cup (2, \infty)$

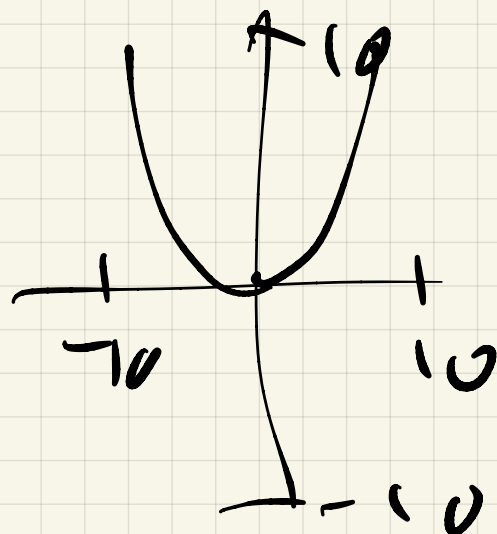
$$\frac{x^2 - 2x}{2x - 4} = \frac{x(x-2)}{2(x-2)} = \frac{x}{2}$$



(b)  $y = .0001 x^2 (10000 - x)$

$D = \mathbb{R}$

Std graphing window

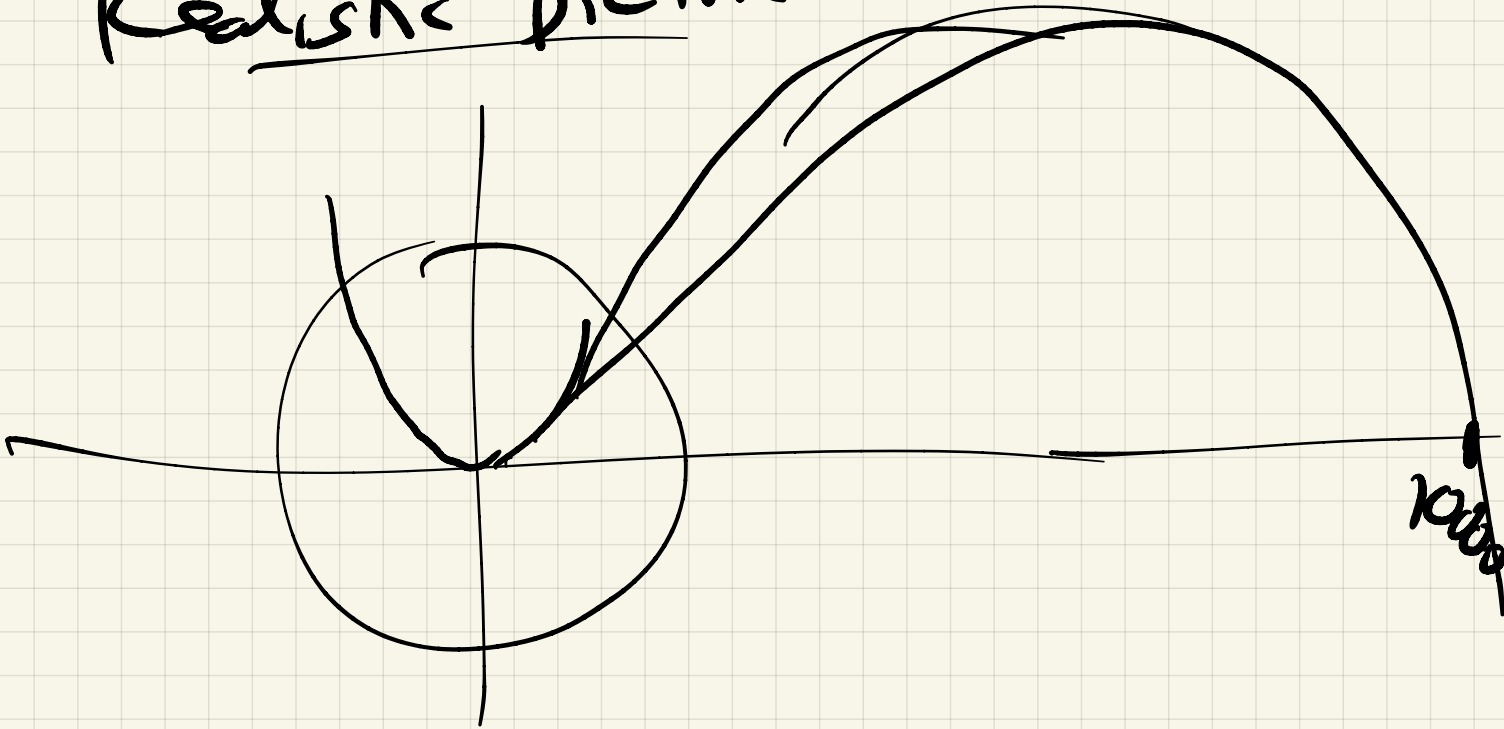


x-intercepts:  $x=0$   $x=10000$

y-int:

$y \Rightarrow$

Realistic picture:



(c)  $y^2 = 4x - x^3$

not a function?

$x > 1$ ,  $y^2 = 9$ ,  $y = \pm \sqrt{3}$

fails vertical line test

Domain:  $y^2 = 4x - x^3$

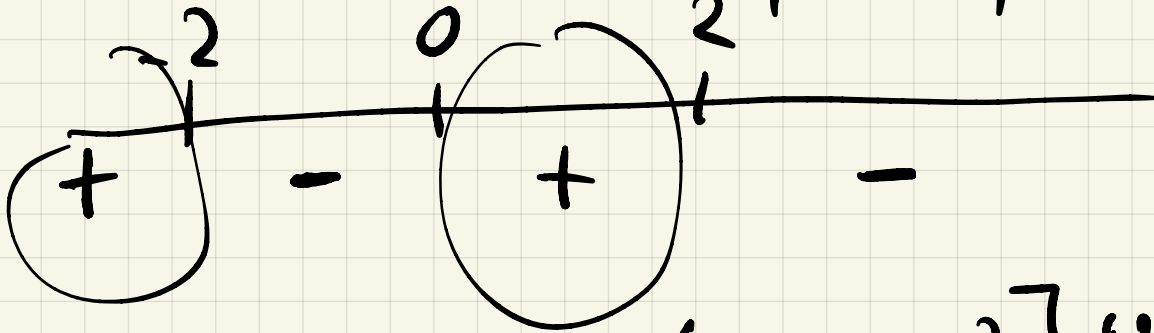
$y = \pm \sqrt{4x - x^3}$

Key: sign  $4x - x^3$

$$x(4 - x^2) =$$

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

$$x = 0, \pm 2$$

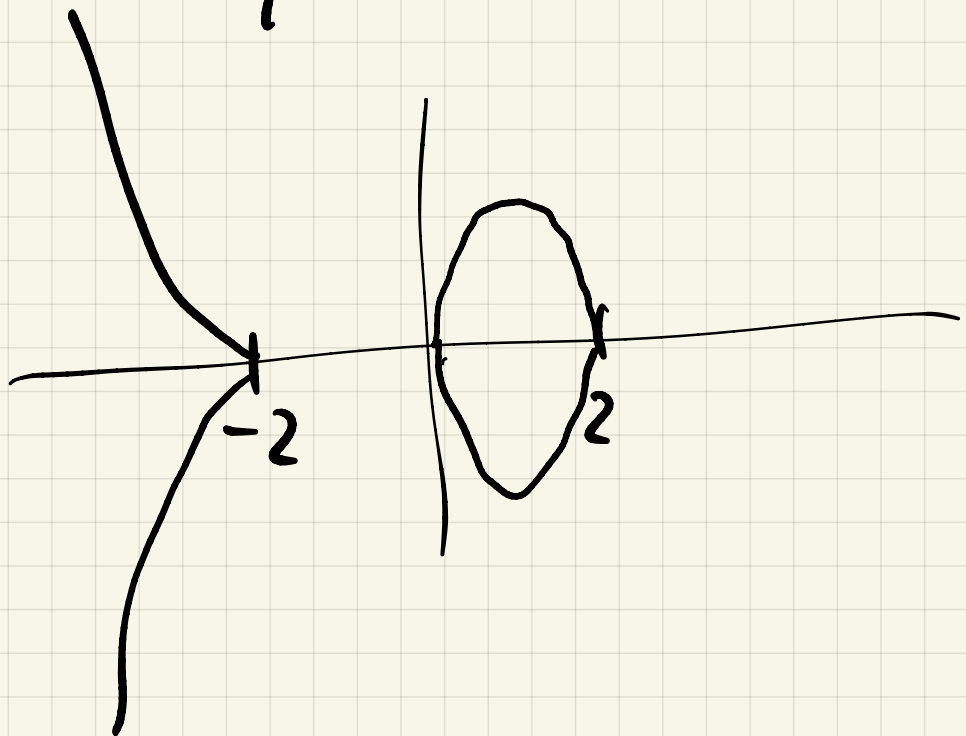


Domain:  $(-\infty, -2] \cup [0, 2]$

x int:  $x = 0, \pm 2$

y int:  $y = 0$

sketch:



(d)  $y = \frac{2x+1}{\sqrt{x-2}}$  ←  $x \neq 2$ ,  $x > 2$

$D = (2, \infty)$

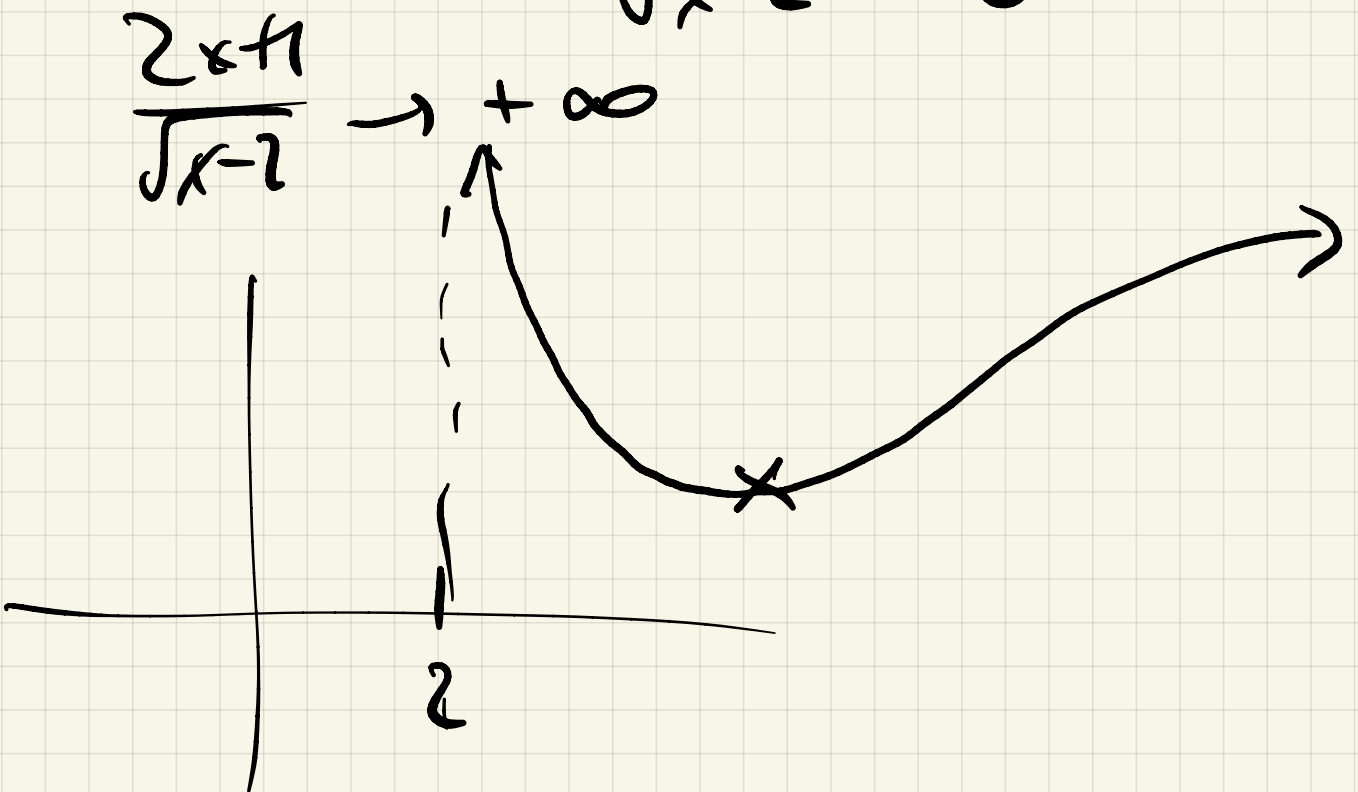
x-ints none

y-ints none

$x = -\frac{1}{2}$  (marked as not in domain)

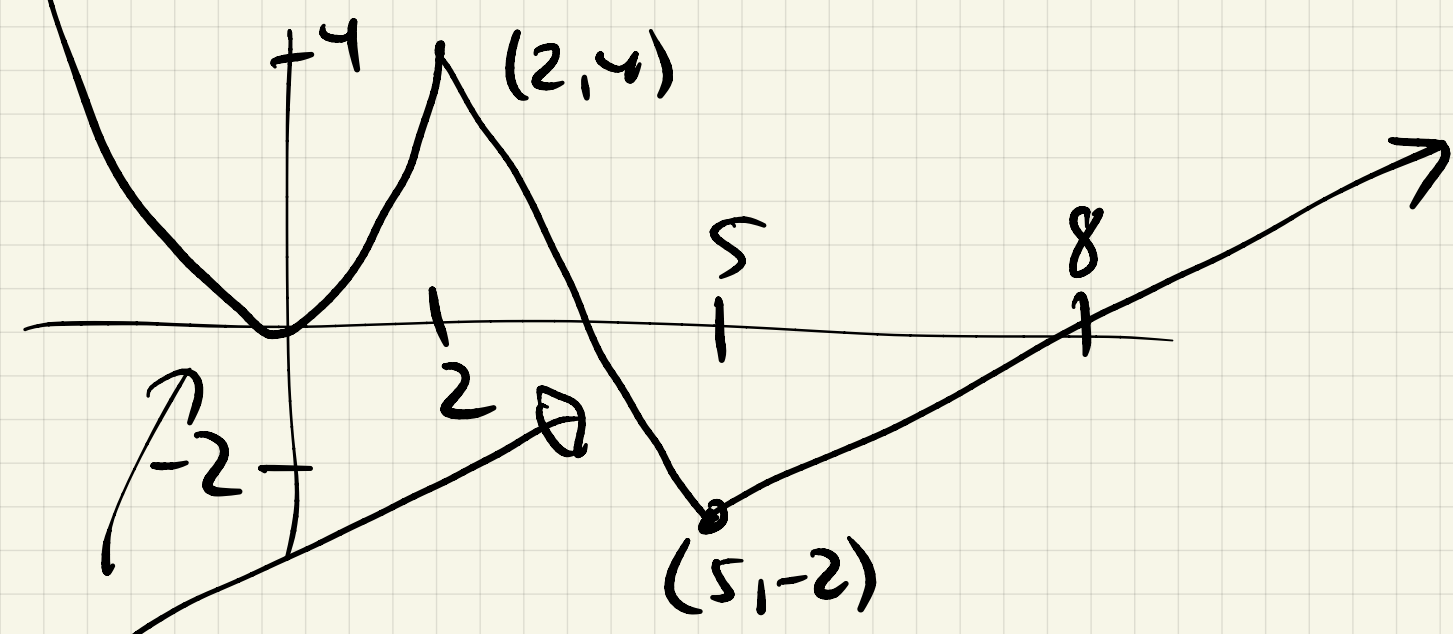
as  $x \rightarrow 2$  from right

top  $\left. \begin{matrix} 2x+1 \rightarrow 5 \\ \sqrt{x-2} \rightarrow 0^+ \end{matrix} \right\} \Rightarrow$



Ex 2

Find a formula for

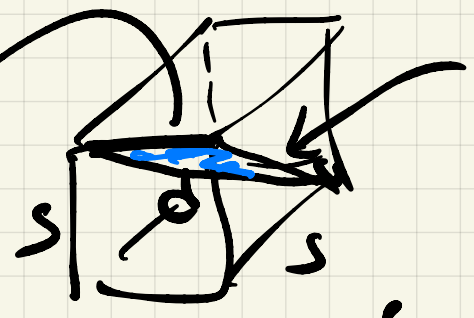


$$f(x) = \begin{cases} x^2 & x \leq 2 \\ -2x + 8 & 2 < x \leq 5 \\ \frac{1}{2}x - 4 & x > 5 \end{cases}$$

$m = -2$

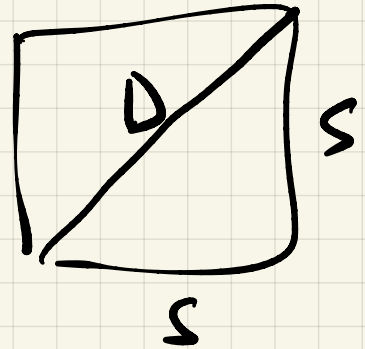
$$y - 4 = -2(x - 2)$$

Ex 3 #11



If  $d =$  long diagonal of cube  
 $s =$  side length

find formula for  $s$  in terms of  $d$ ,  
(find surface area / volume)



$$d^2 = s^2 + D^2$$

$$d^2 = s^2 + 2s^2 = 3s^2$$

$$s^2 = \frac{d^2}{3} \Rightarrow s = \frac{d}{\sqrt{3}}$$

$$\text{Volume} = s^3 = \frac{d^3}{3\sqrt{3}}$$

$$\text{SA} = 6s^2 = \frac{6d^2}{3} = 2d^2$$