

Math 112

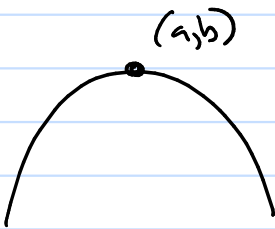
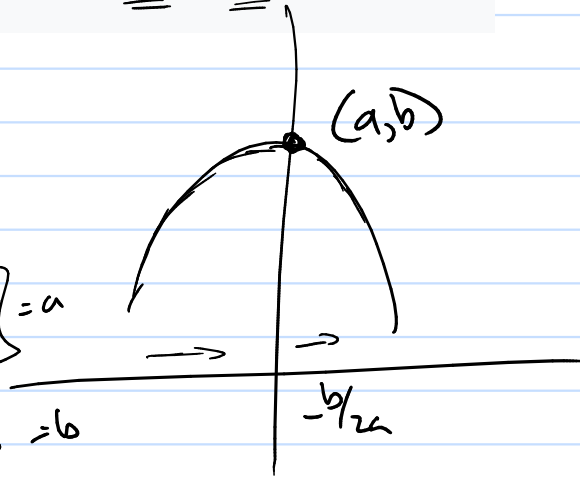
Q's

An espresso stand finds that its weekly profit is a function of the price, x , it charges per cup. If x is in dollars, the weekly profit is $P(x) = -3000x^2 + 13200x - 12973.5$ dollars.

$$x = \frac{-b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

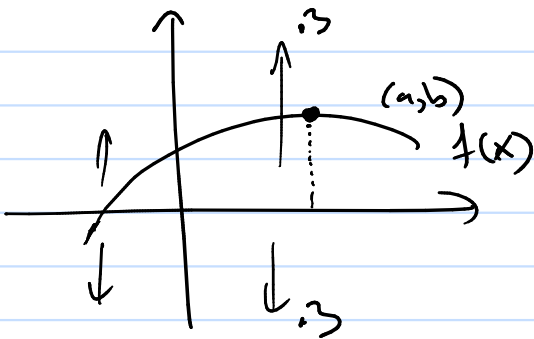
Max @ $x = \frac{-13200}{-6000} = \frac{132}{60} = a$

Max itself is $P\left(\frac{132}{60}\right) = ? = b$

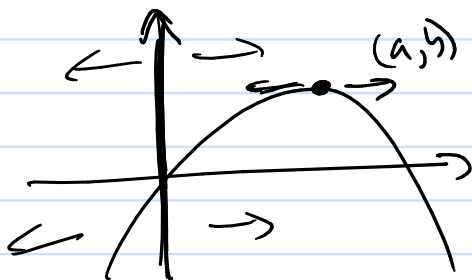


$P(x - 2)$ - move right 2
Vertex goes to $(a+2, b)$

$P(x) - 20$ - move down 20
Vertex goes to $(a, b - 20)$



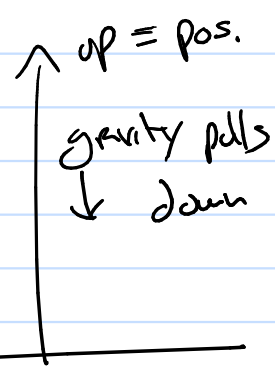
$3f(x)$
↑
Vertical stretch by 3
Vertex goes to $(a, 3b)$



$f(2x)$
↑
horz. stretch by $\frac{1}{2}$
Vertex goes to $(\frac{1}{2}a, b)$

Free Fall Problems

accel. is only gravity.



accel = constant

$$\begin{cases} a = -32 \text{ ft/sec}^2 \\ v = -32t + (v_0) \quad \leftarrow \text{initial velocity} \\ p = -16t^2 + (v_0)t + (h_0) \quad \leftarrow \text{initial position} \end{cases}$$

$$h_0 = 20 \text{ ft}$$

$$v_0 = 10 \text{ ft/sec}$$

$$\rightarrow p(t) = -16t^2 + 10t + 20$$

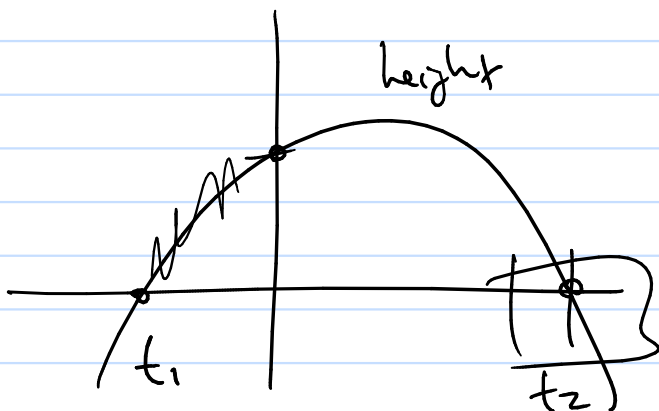
$$v(t) = -32t + 10 \quad \leftarrow$$

$$t \geq 0$$

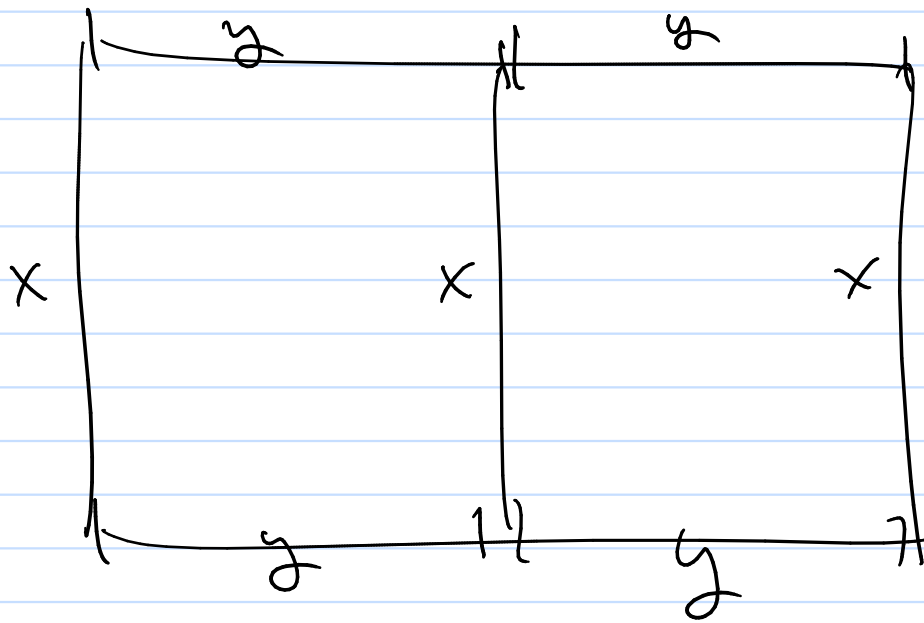
hit the ground?

Solve!

$$0 = -16t^2 + 10t + 20$$



full t



Fence
516

$$\begin{array}{r} 172 \\ 3 \overline{) 516} \\ \underline{3} \\ 21 \\ \underline{21} \\ 0 \end{array}$$

$$3x + 4y = 516 \Rightarrow y = \frac{516 - 3x}{4}$$

total Area:

$2y \cdot x = \text{Total Area}$

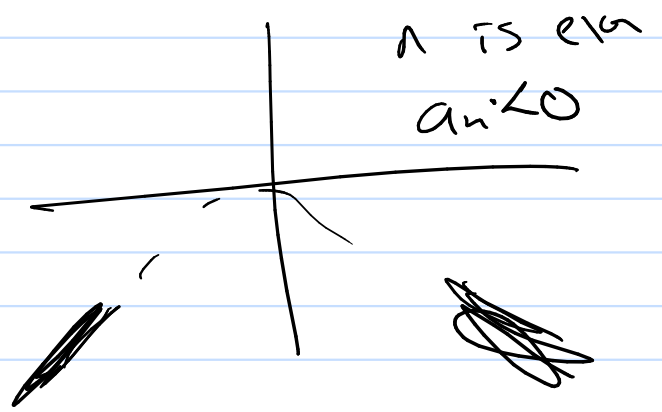
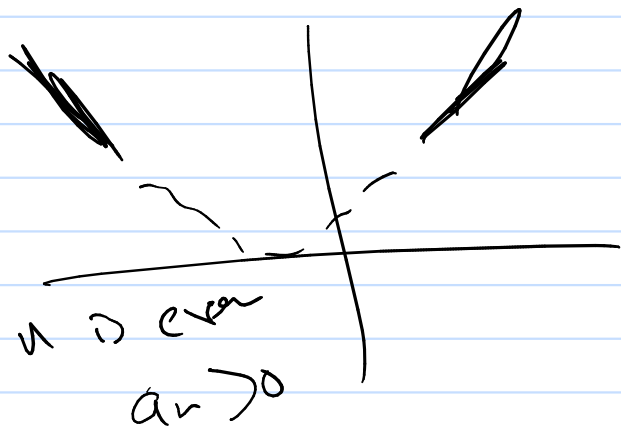
ch3

Polynomials

$$f(x) = a_n x^n + \dots + a_2 x^2 + a_1 x + a_0$$

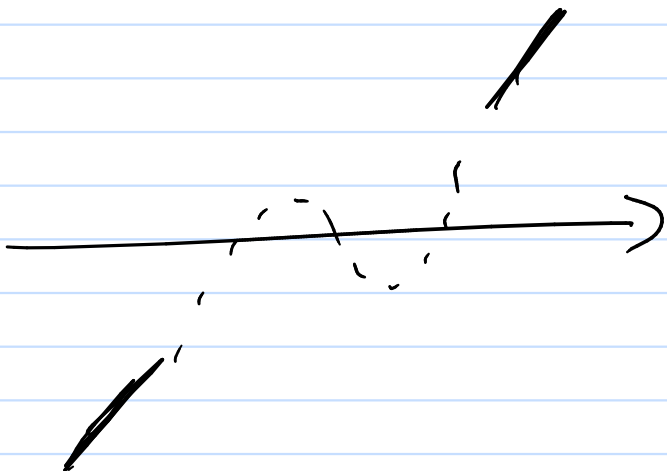
Graph

(i) end behavior $\begin{pmatrix} x \rightarrow \infty \\ x \rightarrow -\infty \end{pmatrix}$



$n \geq 0$

$a_n > 0$



$n \geq 0$

$a_n < 0$



Possible turns?

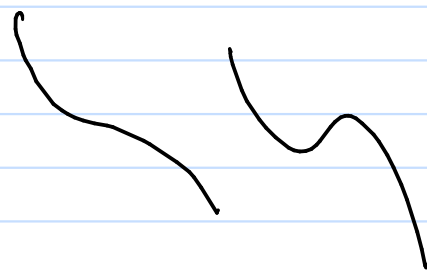
$(n-1)$ at most turns in the graph

$$3x^2 + 2x - 1$$



1 turn.

$$-7x^6 + 10x^5 - x^4 + x^3 - x^2 + 2$$



Intercepts:

y-intercept

$\checkmark x=0$
 $(0, a_0)$

$$f(x) = \underbrace{a_n x^n + \dots + a_2 x^2 + a_1 x}_{\text{polynomial part}} + a_0$$

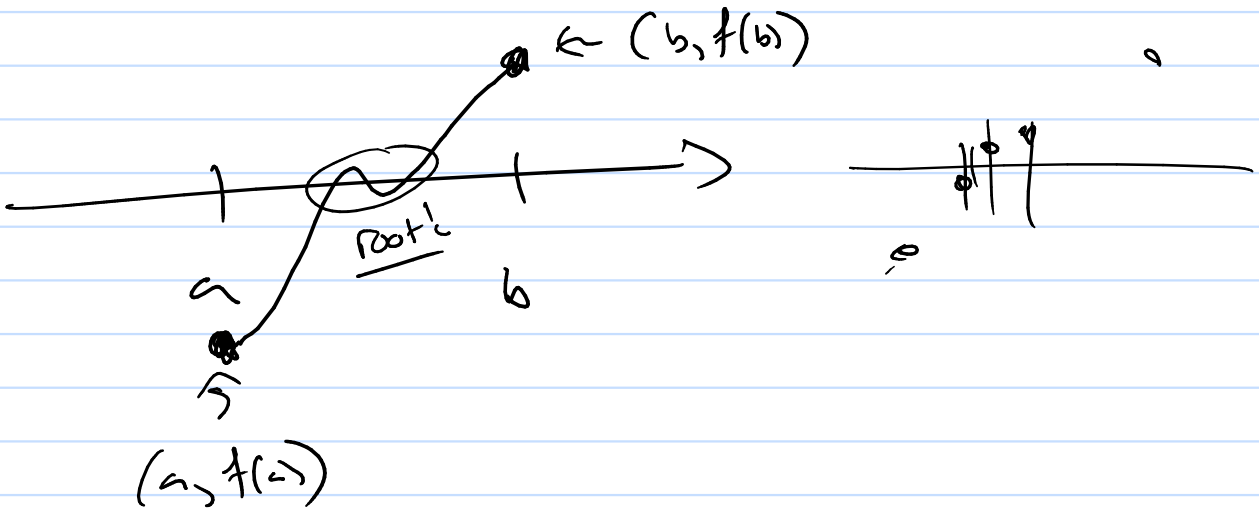
X-intercepts

Solve $0 = a_n x^n + \dots + a_2 x^2 + a_1 x + a_0$

get close:

Intermediate Value Th^m

b/c a polynomial is continuous if for $x=a$
and $x=b$ ($a < b$) the polynomial is
on opposite sides of the x-axis,

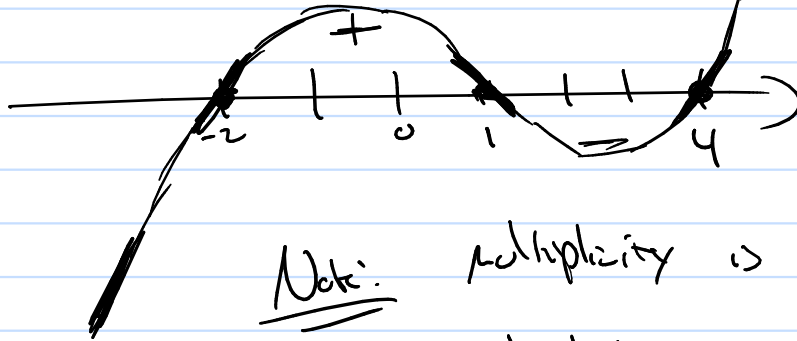


Ideal: it is already factored,

$$f(x) = 3(x-2)(x+1)(x-4)$$
$$= 3 \boxed{(x-2)(x-2)}(x+1)(x-4)$$

$x=2$ is a root that occurs twice

(ex) $f(x) = 3(x-1)^3(x+2)(x-4)$ degree = 5
 lead term = $3x^5$



Note: multiplicity is odd \rightarrow cross axis
 multiplicity is even \rightarrow bounce

$$f(x) = -(x-2)^3(x+1)^2(x-4)^2$$