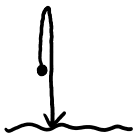
Week 5 Wednesday

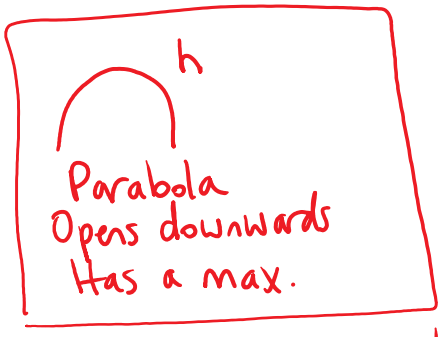
February 6, 2019 7:50 AM

4.4 Quadratic Models Cont'd

Ex: Height (in m) of a ball after t seconds is $h(t) = -4.9t^2 + 3t + 5$



a) When does the ball reach its maximum height?



Find the vertex

~~$x = \frac{-b}{2a}$~~

$$t = \frac{-b}{2a} = \frac{-3}{-9.8} = \frac{30}{98} = \frac{15}{49} \text{ seconds}$$

b) Find the max. height

h ~~$h(t)$~~ $= -4.9t^2 + 3t + 5$

Sub $t = \frac{15}{49}$:

$$h = -4.9\left(\frac{15}{49}\right)^2 + 3\left(\frac{15}{49}\right) + 5$$

$$\approx 5.46 \text{ m}$$

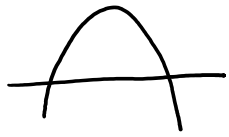
4.5 Quadratic Inequalities

Ex: Solve $-2x^2 + 30x \leq 52$

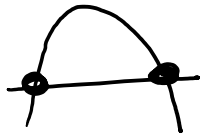
1) Write it as $y \leq 0$ or $y \geq 0$

[Get 0 on one side]

$$\underbrace{-2x^2+30x-52}_{y} \leq 0$$



2) Find the x-intercepts of y



$$y = -2x^2+30x-52$$

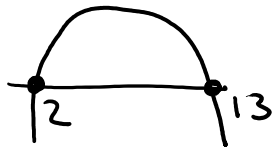
Set $y=0$

$$0 = -2x^2+30x-52$$

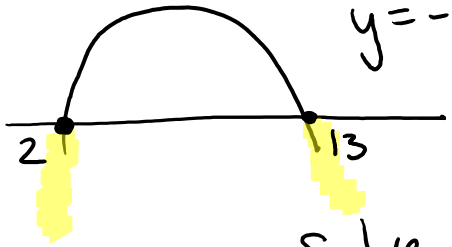
$\div(-2)$: $$0 = x^2-15x+26$$

$$0 = (x-13)(x-2)$$

$$x = 2, 13$$



3) Graph



Solve $y \leq 0$ [find x]

$x \leq 2$ and $x \geq 13$

$(-\infty, 2] \cup [13, \infty)$

Ex: Solve $2x^2 < 5x + 3$

1) All terms on one side

$$2x^2 - 5x - 3 < 0$$

2) Make it an equation

$$2x^2 - 5x - 3 = 0$$

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

$$= \frac{5 \pm \sqrt{(-5)^2 - 4(2)(-3)}}{4}$$

$$= \frac{5 \pm \sqrt{49}}{4}$$

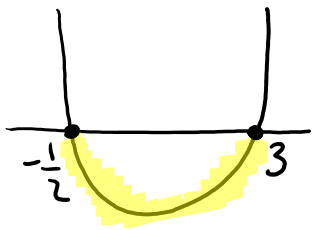
$$= \frac{5 \pm 7}{4}$$

$$= -\frac{2}{4}, \frac{12}{4} \quad \text{or} \quad -\frac{1}{2}, 3$$

3) Graph

Solve $2x^2 - 5x - 3 < 0$

$y = 2x^2 - 5x - 3$



Solve $y < 0$

$-\frac{1}{2} < x < 3$

Ch 5 Polynomials

5.1 Polynomial Functions

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

Don't Memorize!

Coefficients: $a_n, a_{n-1}, \dots, a_0$

any real numbers

a_n is the **leading coefficient**

a_0 is the **constant**

powers of x can be $0, 1, 2, \dots$

degree of a polynomial: highest power of x

Ex: $y = 9x^3 - \sqrt{2}x^2 + \pi$

leading coefficient is 9

constant is π

degree is 3

Ex: Identify the degree

a) $y = 5x^4$

4

b) $y = -17x$

1

c) $y = -17 = -17x^0$

0

Special case: $y = 0$
degree is undefined

d) $y = (x^2+1)(x^2-4) = x^4 + \ldots$

4

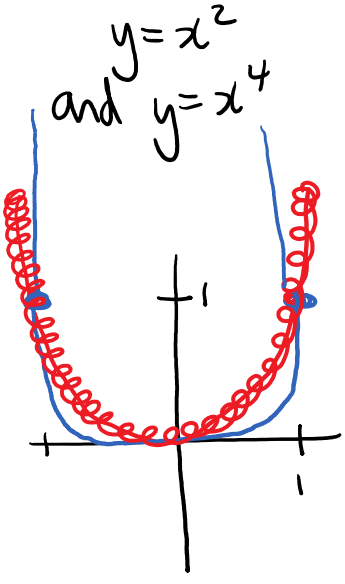
Ex: Not polynomials

$\sqrt{x} = x^{1/2}$

$\frac{1}{x} = x^{-1}$

Some Common Graphs:

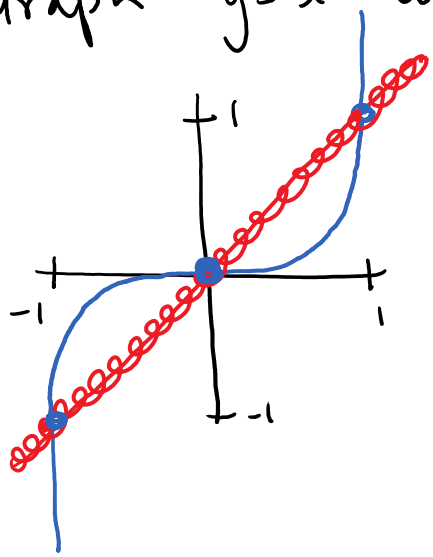
$y = x^2$ and $y = x^4$



$y = x^2$

$y = x^4$

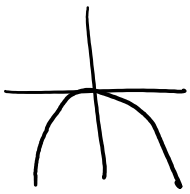
Graph $y = x$ and $y = x^3$



$y = x$

$y = x^3$

Graph $y = -x^2$



$y = -x^3$