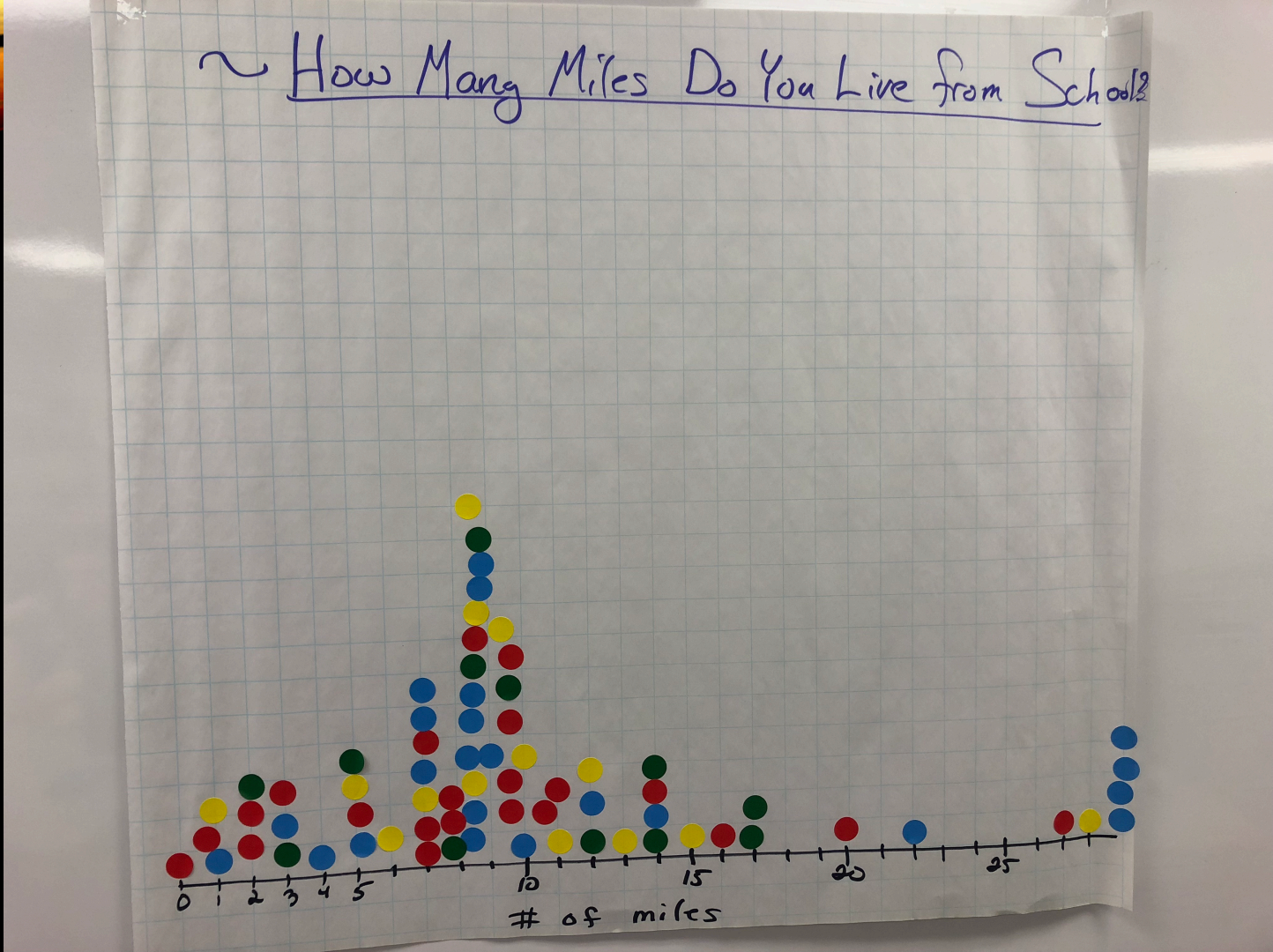
What Does the Graph Say: Forcing Students to Think

Jennifer North Morris
Marana High School, Tucson AZ

3-2-1

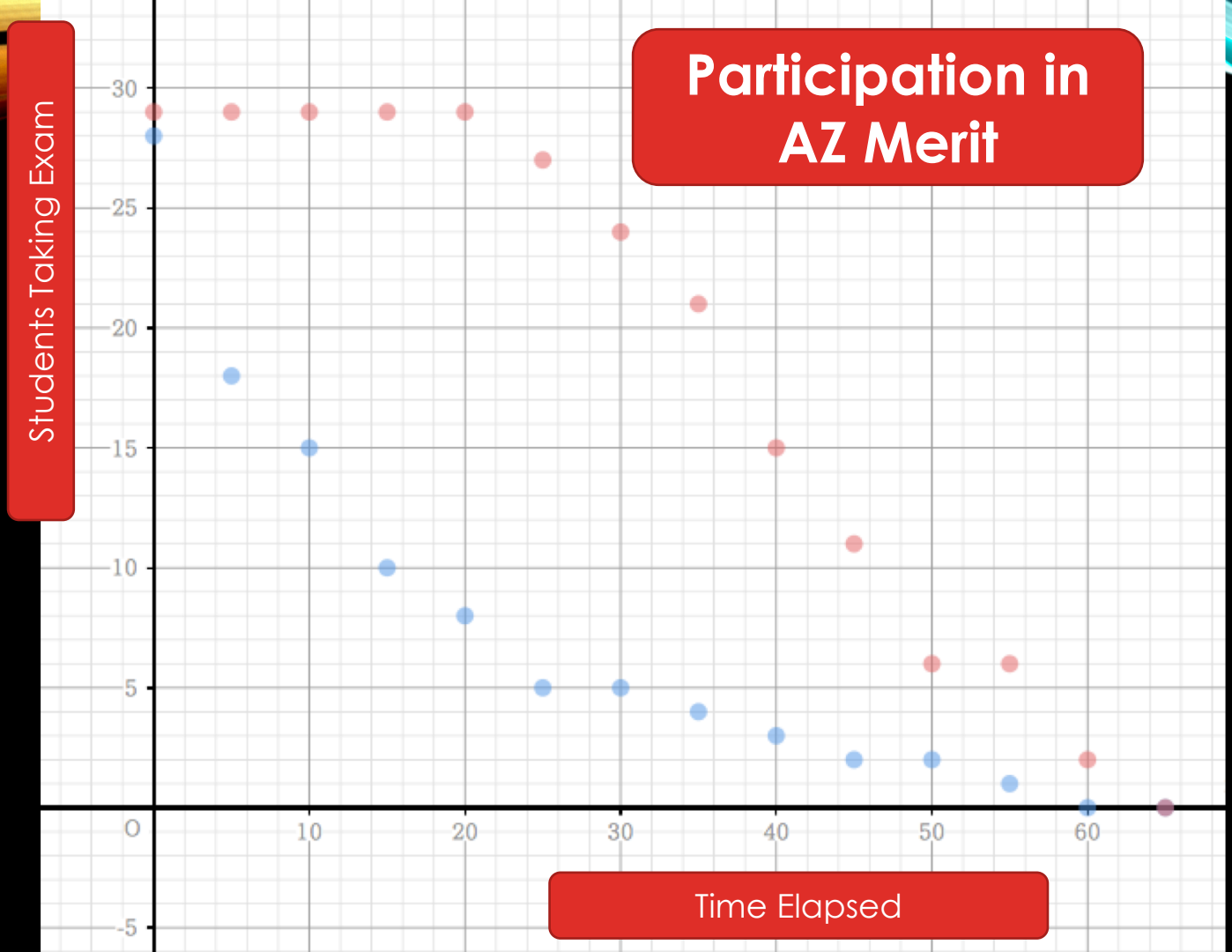
- 3 Facts
- 2 Questions
- 1 Implication



3-2-1

Mystery Data --> Classpad.net

- 3 Facts
- 2 Questions
- 1 Implication

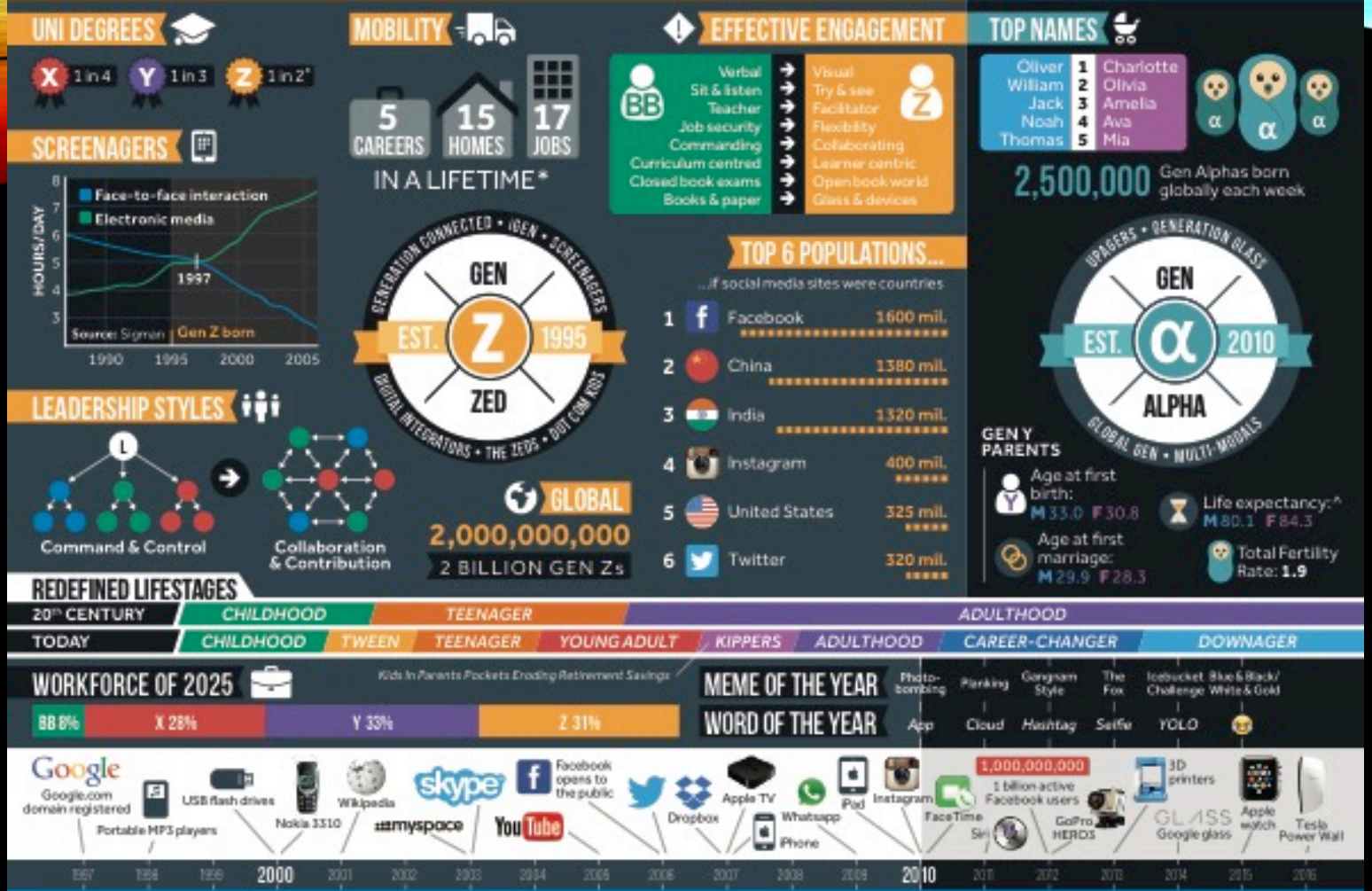


Questions for the Hour

- How do graphs spark conversation?
- Graphing technology: how is this a tool and not a crutch?
- Assessment: What types of questions demonstrate understanding? (and not the ability to use technology)

Before we go any further…
How do our kids learn?

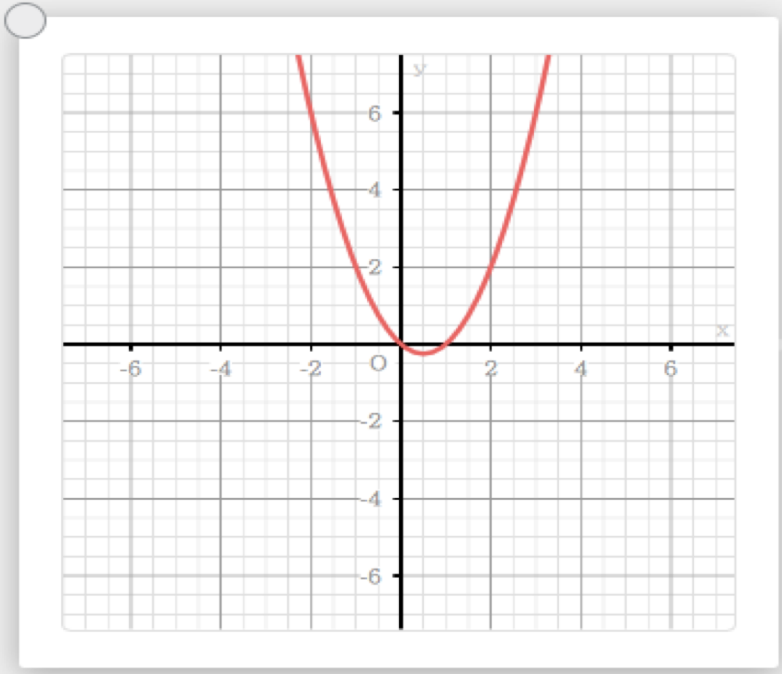
- Individual exploration
- Collaboration
- Google


UNI DEGREES
X 1 in 4
Y 1 in 3
Z 1 in 2*
SCREENAGERS
Face-to-face interaction
Electronic media
1997
Source: Sigman | Gen Z born
HOURS/DAY
1990 1995 2000 2005
LEADERSHIP STYLES
Command & Control
Collaboration & Contribution
MOBILITY
5 CAREERS
15 HOMES
17 JOBS
IN A LIFETIME*
GEN Z ZED
EST. 1995
GENERATION CONNECTED • iGEN • SCREENAGERS
DIGITAL INTEGRATORS • THE ZEDS • DOT COM KIDS
GLOBAL
2,000,000,000
2 BILLION GEN Zs
EFFECTIVE ENGAGEMENT
Verbal → Visual
Sit & listen → Try & see
Teacher → Facilitator
Job security → Flexibility
Commanding → Collaborating
Curriculum centred → Learner centric
Closed book exams → Open book world
Books & paper → Glass & devices
TOP 6 POPULATIONS...
...if social media sites were countries
1 Facebook 1600 mil.
2 China 1380 mil.
3 India 1320 mil.
4 Instagram 400 mil.
5 United States 325 mil.
6 Twitter 320 mil.
TOP NAMES
Oliver 1 Charlotte
William 2 Olivia
Jack 3 Amelia
Noah 4 Ava
Thomas 5 Mia
2,500,000 Gen Alphas born globally each week
GEN α EST. 2010 ALPHA
UPAGERS • GENERATION GLASS
GLOBAL GEN • MULTI-MODALS
GEN Y PARENTS
Age at first birth: M 33.0 F 30.8
Life expectancy:^ M 80.1 F 84.3
Age at first marriage: M 29.9 F 28.3
Total Fertility Rate: 1.9
REDEFINED LIFESTAGES
20th CENTURY: CHILDHOOD | TEENAGER | ADULTHOOD
TODAY: CHILDHOOD | TWEEN | TEENAGER | YOUNG ADULT | KIPPERS | ADULTHOOD | CAREER-CHANGER | DOWNAGER
WORKFORCE OF 2025
Kids In Parents Pockets Eroding Retirement Savings
BB 8% X 28% Y 33% Z 31%
MEME OF THE YEAR: Photo-bombing | Planking | Gangnam Style | The Fox | Icebucket Challenge | Blue & Black/ White & Gold
WORD OF THE YEAR: App | Cloud | Hashtag | Selfie | YOLO
Google
Google.com domain registered
Portable MP3 players
USB flash drives
Nokia 3310
Wikipedia
myspace
skype
YouTube
Facebook opens to the public
Dropbox
Apple TV
Whatsapp
iPhone
iPad
Instagram
FaceTime
Siri
1,000,000,000
1 billion active Facebook users
GoPro HERO5
3D printers
GLASS
Google glass
Apple watch
Tesla Power Wall
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
mccrindle
mccrindle.com.au • generationz.com.au
*Future forecasts. ^Life expectancy of Gen Alpha at birth
Source: ABS, McCrindle | ©McCrindle 2014

Graphing technology: how is this a tool and not a crutch?

Exploration & Discovery → Let's play with transformations

Turn & Talk: What is going on?



$y = (x-a)(x-b)$

a = 0 Step: 1

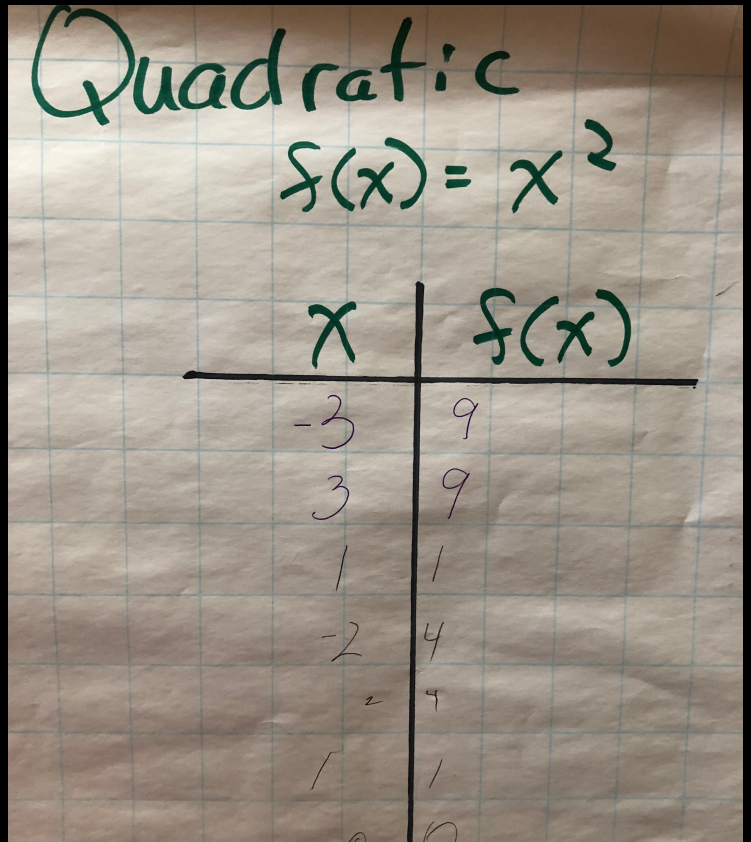
-5 5

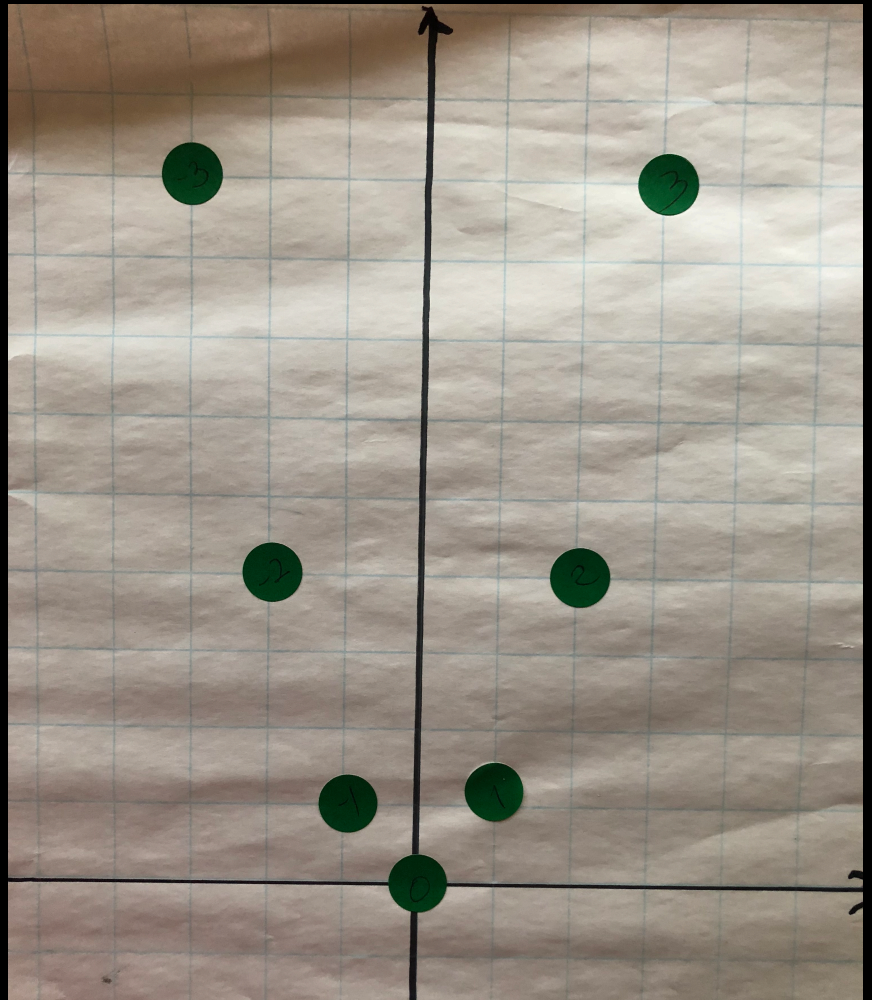
b = 1 Step: 1

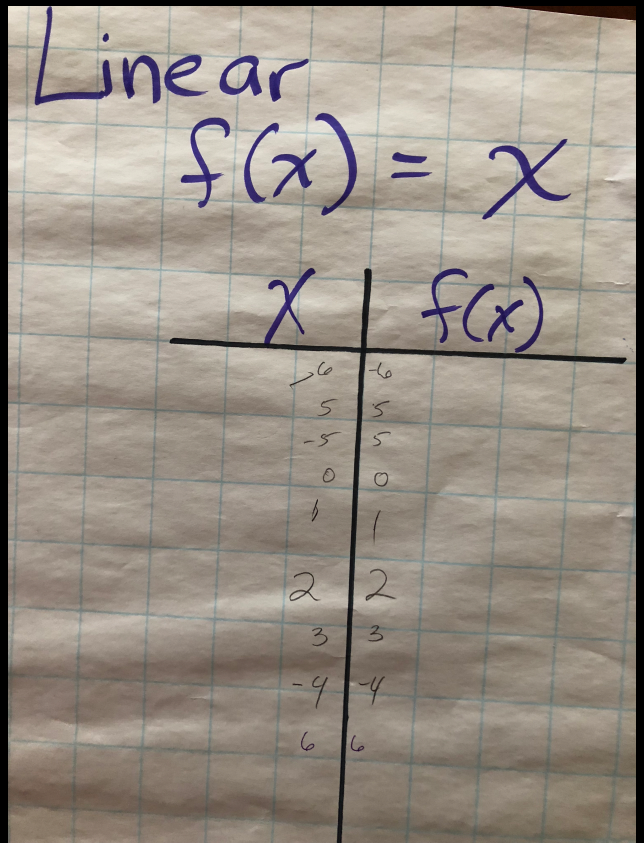
-5 5

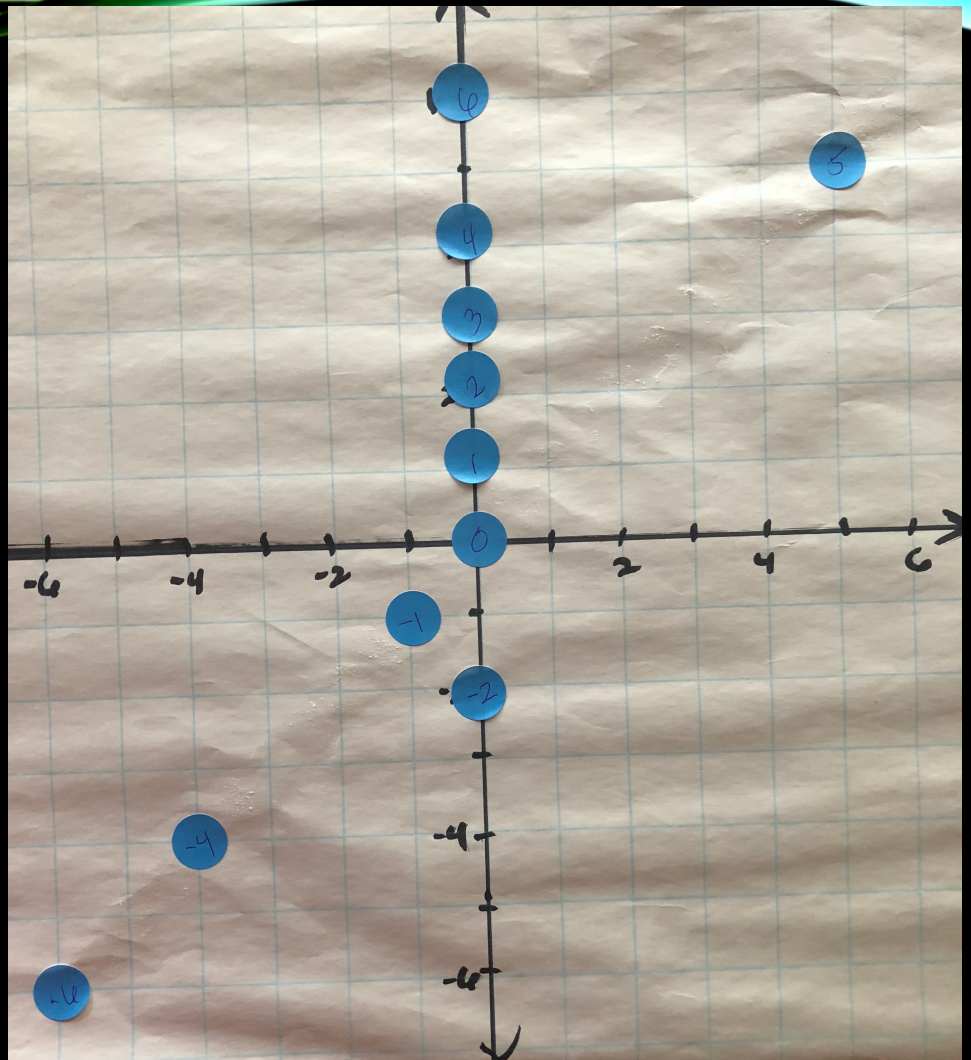
Word of Caution: Low tech has power too!!!
…and is necessary

Sticky Dot Graphs






Linear
f(x) = x
x
f(x)
-6
5
-5
0
1
2
3
-4
6


6
4
3
2
1
0
-1
-2
-4
-6
-6
-4
-2
2
4
6
5
-4

Graphing technology: how is this a tool and not a crutch?

Moving beyond algebra 1

$$y = (x-h)^a + k$$

$f_{(x)}$

a = 5 Step: 1

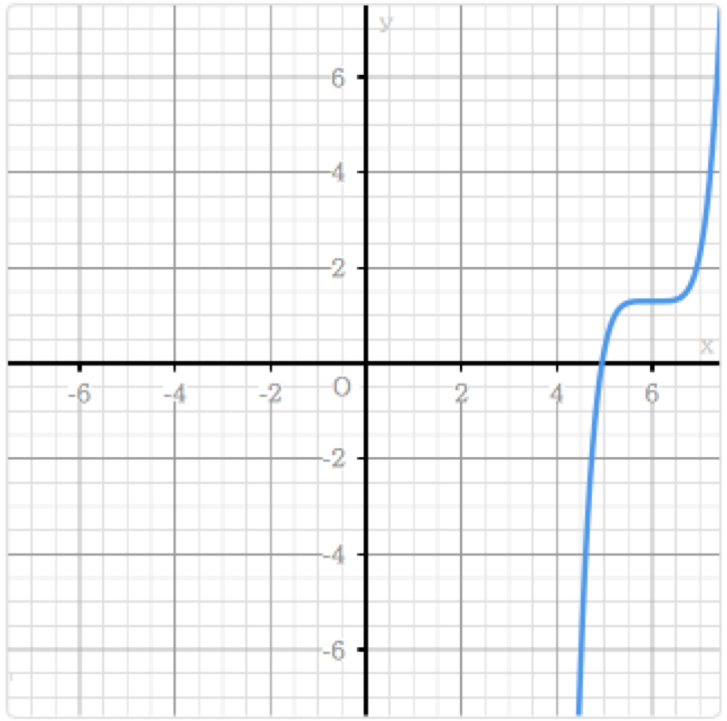
0 10

h = 6 Step: 1

-6 6

k = 1.3 Step: 1

-6 6



Assessment: What types of questions demonstrate understanding?

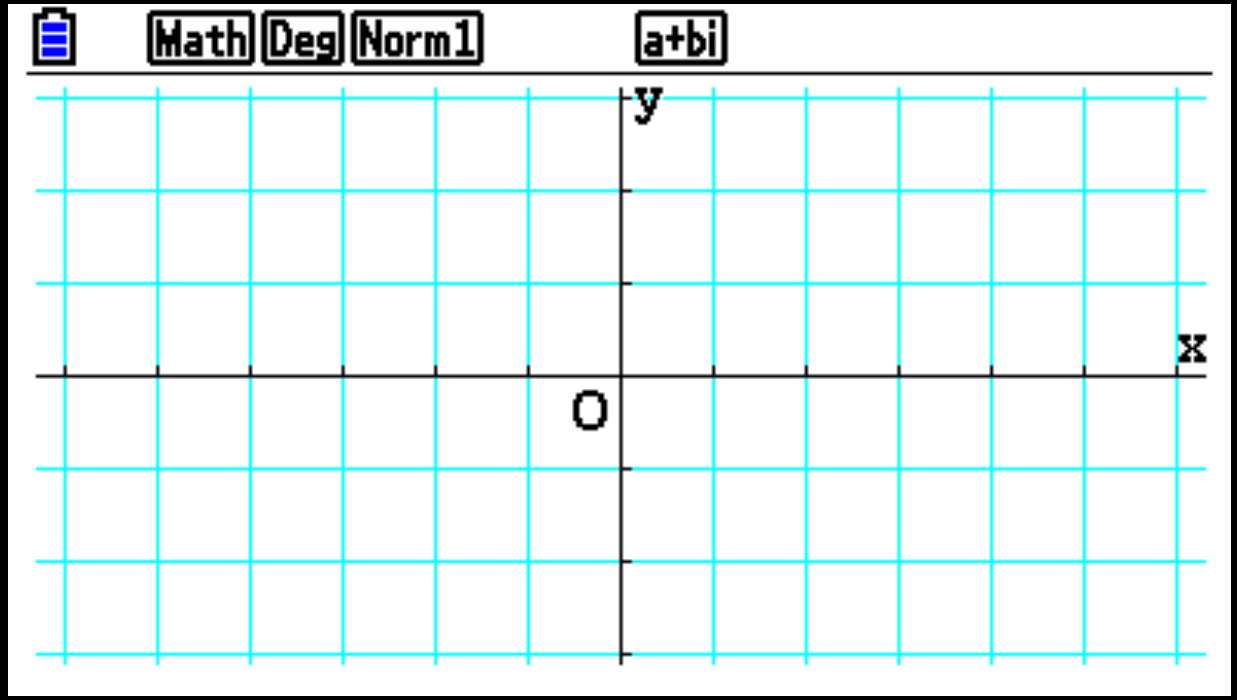
Polynomial Aerobics

Polynomial Degree Aerobics

$$y = x^2$$

Polynomial Degree Aerobics

$$y = x^3$$



Polynomial Degree Aerobics

$$y = -x^2$$

Polynomial Degree Aerobics

$$y = x^4$$

Polynomial Degree Aerobics

$$y = x^5$$

Polynomial Degree Aerobics

$$y = x^6$$

Polynomial Degree Aerobics

$$y = -x^4$$

Polynomial Degree Aerobics

$$y = x^2 + 1$$

Polynomial Degree Aerobics

$$y = -(x - 1)^3$$

Polynomial Degree Aerobics

$$y = (x + 1)^2 - 2$$

Polynomial Degree Aerobics

$$y = x^{-1}$$

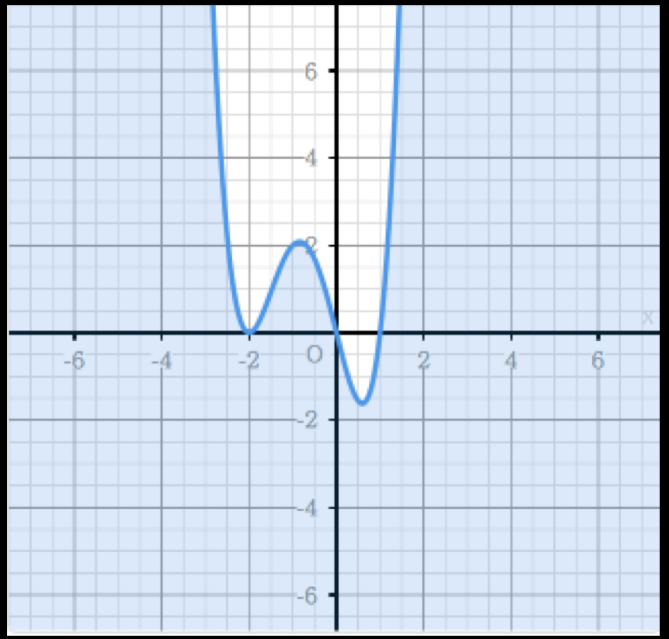
Assessment: What types of questions demonstrate understanding?

Turn & Talk: Solve this equation using at least 2 different methods:

$$x^2 - x - 12 = 0$$

How are these graphs different?

$y \leq x(x-1)(x+2)^2$

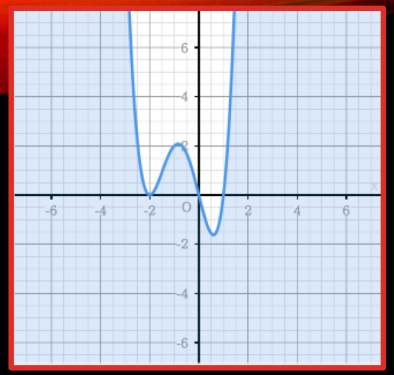


$y < x(x-1)(x+2)^2$

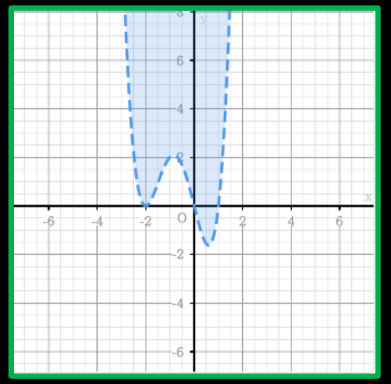
$y > x(x-1)(x+2)^2$

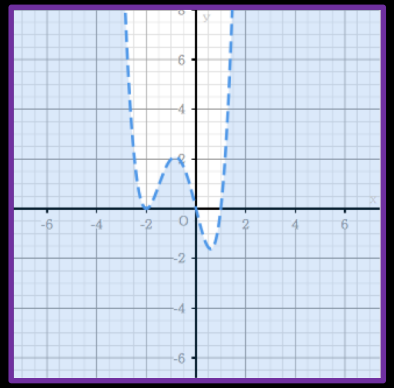
$y \geq x(x-1)(x+2)^2$

$y \leq x(x-1)(x+2)^2$

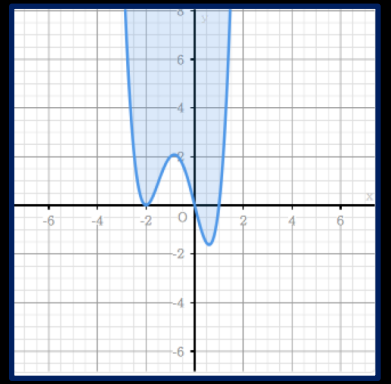


$y > x(x-1)(x+2)^2$





$y < x(x-1)(x+2)^2$

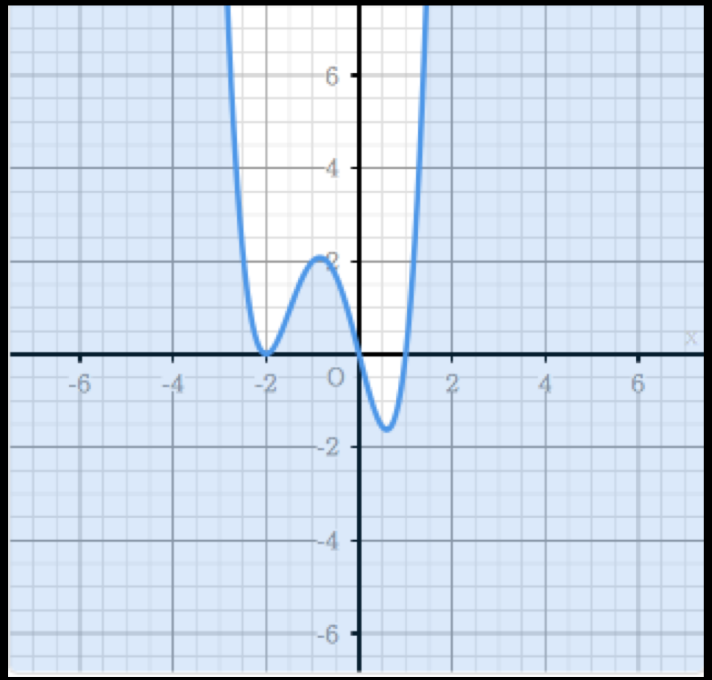


$y \geq x(x-1)(x+2)^2$

What's the difference?

$y \leq x(x-1)(x+2)^2$

$0 \leq x(x-1)(x+2)^2$

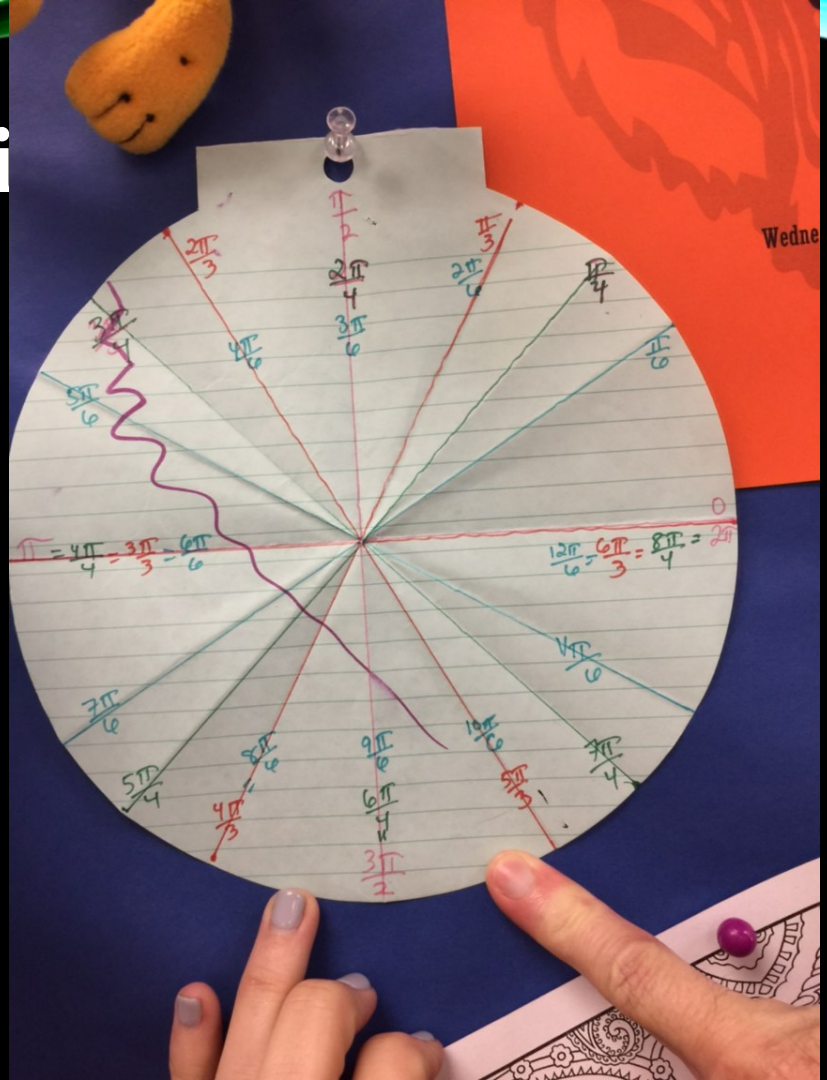


$(-\infty, 0] \cup [1, \infty)$

Kahoot! Time for Prizes!

Uni

- Geogebra Unit Circle
- Thanks, Jeff Holcomb!



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THANKS!

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jnomo@me.com

Resources will be posted on online program