

Family of Functions Lesson

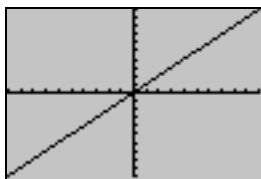
Introduction:

Show pictures of family members to illustrate that even though family members are different (in most cases) they have very similar characteristics (DNA).

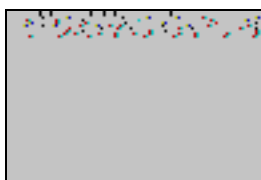
"Today we are going to investigate a variety of different families of functions. Similar to human beings, mathematical families have similar characteristics within a family. The first mathematical families we are

- 6) As a class, determine and substitute in two values for x and determine the correct values for y . Fill in the t -table, plot the two points, and draw the line.

Students should see the following graph on their calculator:



- 16) Tell students that the calculator found values just like we did on our t -table, just faster. Using your overhead calculator show them the t -table by pressing on 2^{nd} function and Graph. The screen will show a t -table such as:

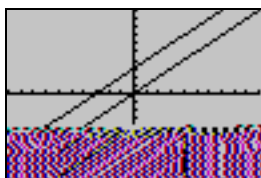


You can move through the t -table by using your up and down arrow keys. If students look at their t -tables you will need to have them press on the Graph key to get back to the graph.

Investigating $y = x + b$:

- 17) "Now we are going to look at what affect adding or subtracting a number has on the mother function. Let's try adding 3. Any ideas on what the graph will do when we add 3?" Have students make predictions before they enter it into the calculator.
- 18) "Press on $Y=$. Press the down arrow key one time to go to Y_2 . Press on x then press $+ 3$. Now press the Graph key."

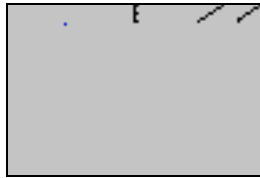
Students should see the following graphs on their calculator:



- 19) Summarize: "Adding 3 to the mother of all lines moved the line up 3 units. We call that a vertical phase shift."

- 20) "Based on this, do you have an idea of what the graph of $y = x - 4$ might look like? What happens to the mother of all lines when you subtract 4?" Have students make predictions before they enter it into the calculator.
- 21) "Press on $Y=$. Press the down arrow key two times to go to Y_1 . Press on x then press $- 4$. (Note: Press the subtraction key, not the negative key.) Now press the Graph key."

Students should see the following graphs on their calculator:



- 22) Summarize: "Subtracting 4 from the mother of all lines moved the line down 4 units. This is also called a vertical phase shift because we are moving the graph up or down."

Check for understanding:

- A) "So what happens to the graph of $y = x + a$ when:
- i) a is positive? [Moves the graph up]
 - ii) a is negative? [Moves the graph down]
- B) Without students seeing (turn the overhead off), enter the graph $y = x + 7$. Now turn the overhead on and ask them to write the equation of the graph that is shown. "On the count of 3, read the equation you wrote down." [Y equals x plus 7]

Investigating $y = mx + b$:

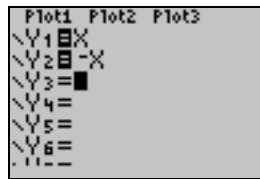
- 23) "Now we are going to investigate other members of the family of lines. Press $Y=$, press clear, and clear each of the equations shown on your screen. Note: you will need to use the up and down arrow keys to scroll through the equations so that you can clear them."

- 24) "Since we know what the mother of line ($y = x$) looks like, what do you think the opposite of the mother might look like ($y = -x$)?"

Have students show you with their hands what the mother looks like. Now have them do the opposite.

- 25) "Press on $Y=$. Enter the mother of all lines $y = x$. Press the down arrow key one time to go to $y = -x$. Press the negative key. Press the x key.

Students should see the following screen on their calculator:



Check for understanding:

- A) Describe the difference between the graph of $y = x$ and $y = -x$.
- B) "So what happens to the graph of $y = -x + b$ when:
- i) b is positive? [Moves the graph up]
 - ii) b is negative? [Moves the graph down]
- C) Without students seeing (turn the overhead off), enter the graph $y = -x + 5$. Now turn the overhead on and ask them to write the

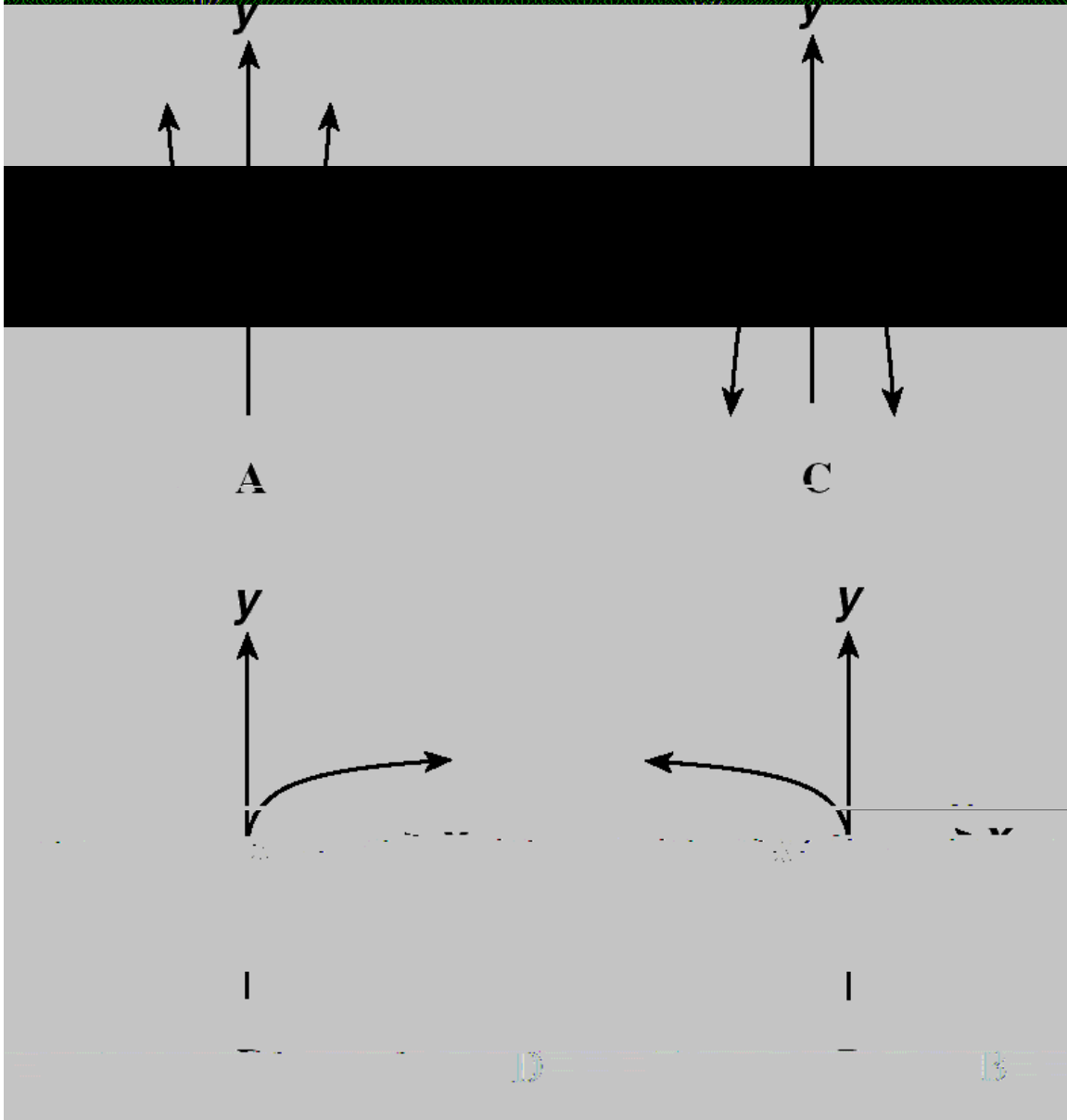
Investigating other Families of Functions – Quadratic Family

Possible Extension:

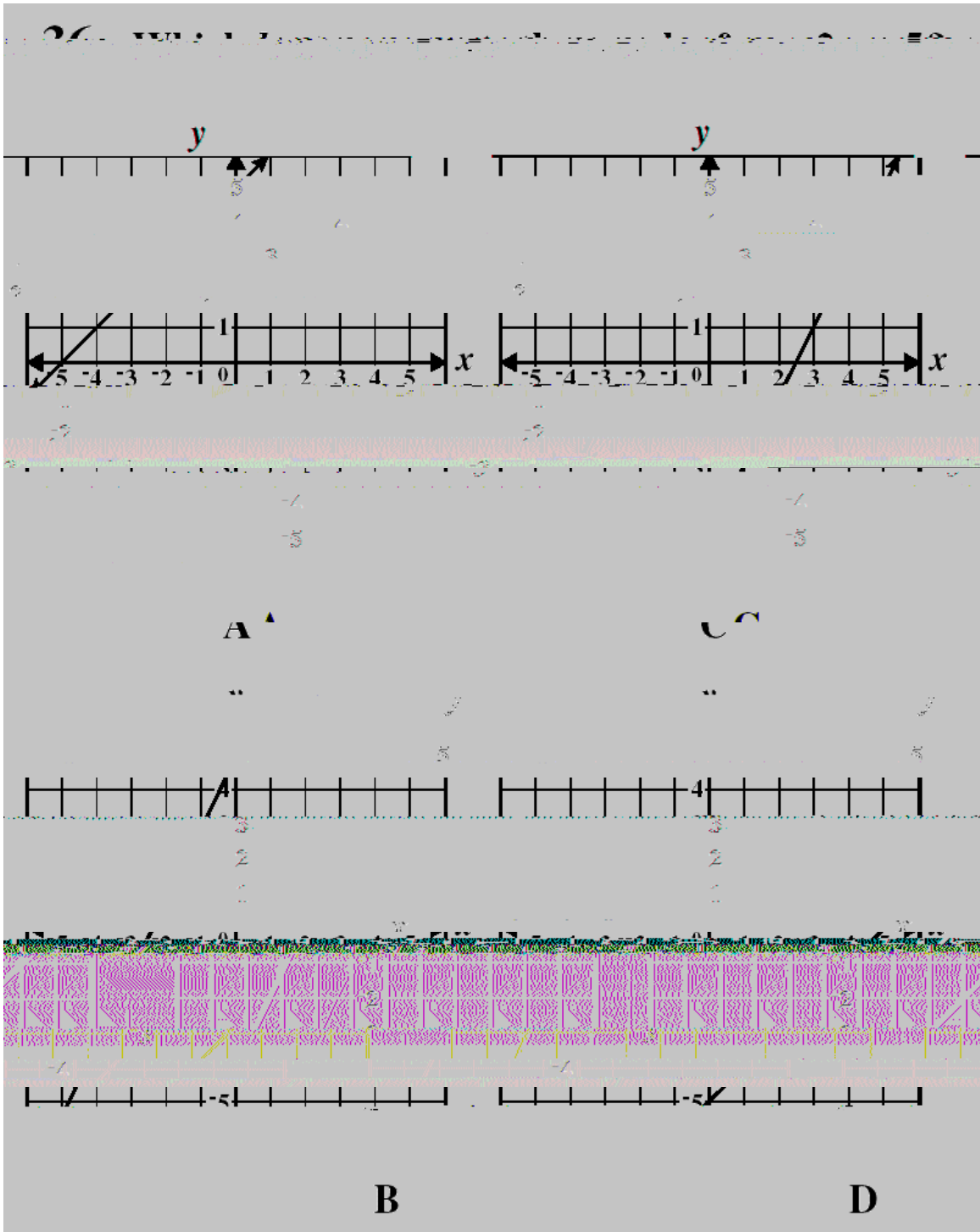
If you want to try to fool your students...

- 1) Tell them that the graphing calculators are amazing tools – almost like a small computer in your hand. The calculators have built-in sensors. Point out the “sensor” on the front left of the calculator.
- 2) We are going to use this sensor to monitor your heart rate.
- 3) First have students press on $y=$ and clear all.
- 4) Tell the students that they have to follow directions precisely or the heart monitor will not work properly.
- 5) Have them press the *TAN* key (it is to the left of the caret (^) key).

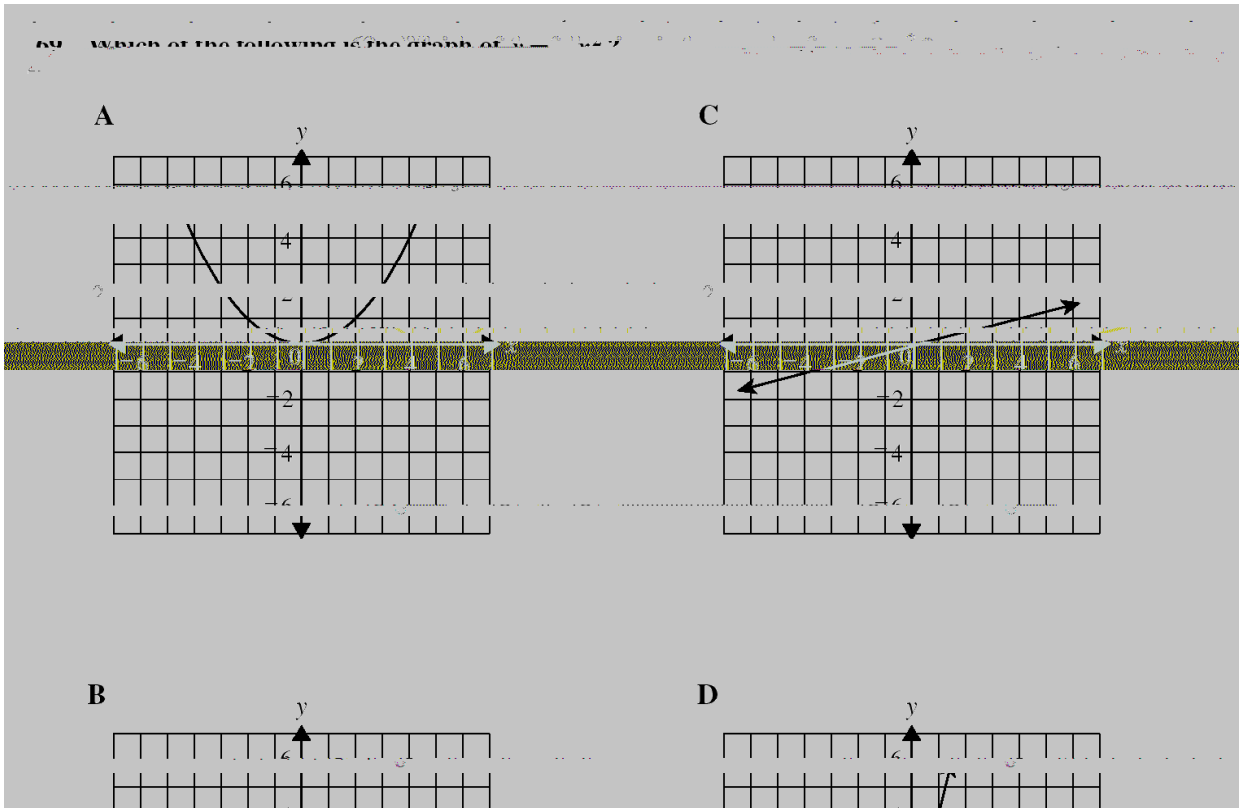
35. Which graph shows $y = -x^2$?



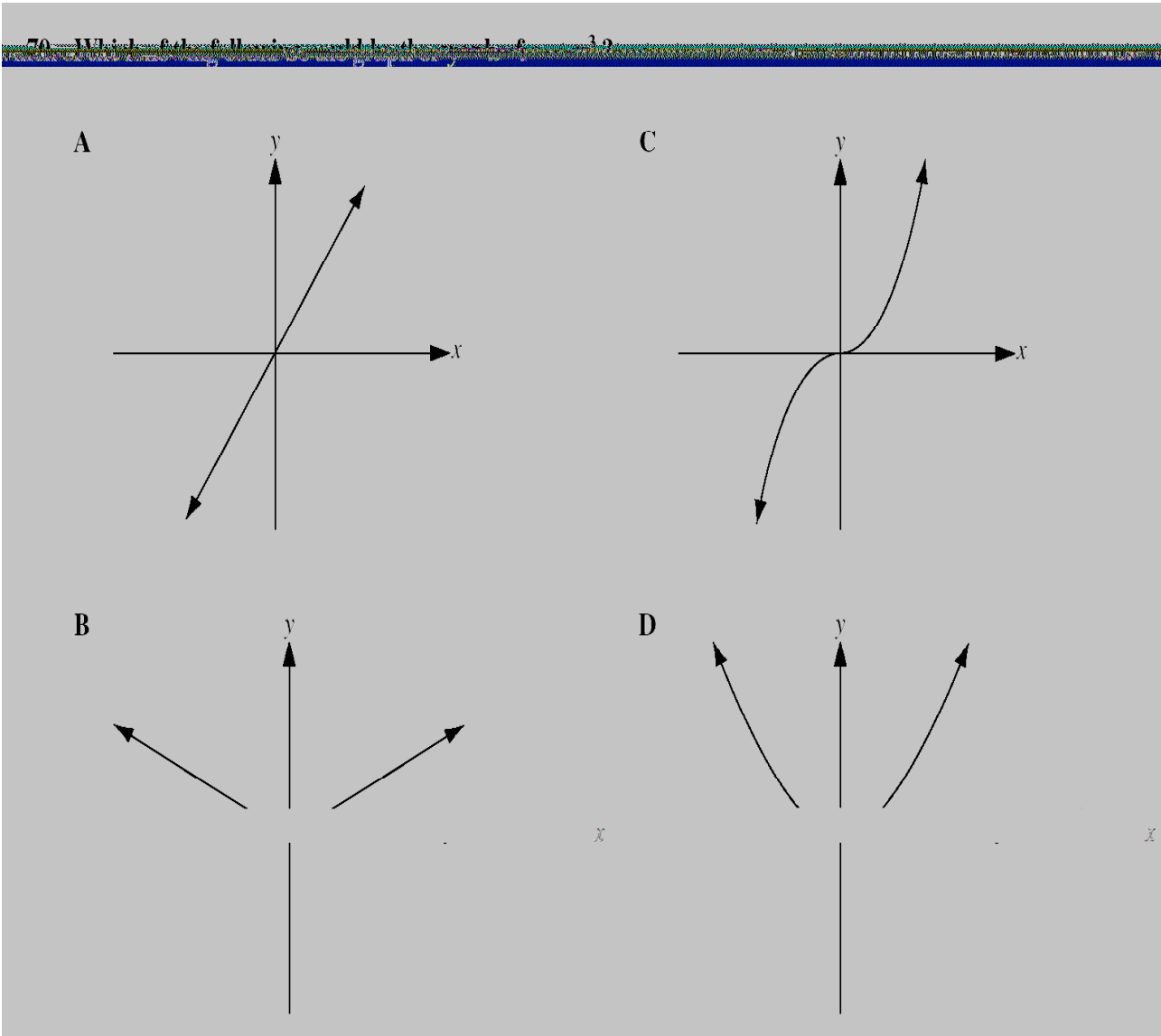
Grade 7 CST Released Item:



CAHSEE CST Released Item:



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CAHSEE CST Released Item:

A coordinate plane with a grid. The x-axis is labeled 'x' and has tick marks from -3 to 5. The y-axis is labeled 'y' and has tick marks from -1 to 6. A line is graphed passing through the points (-1, 0) and (0, -1). The line has a positive slope and a y-intercept of -1.

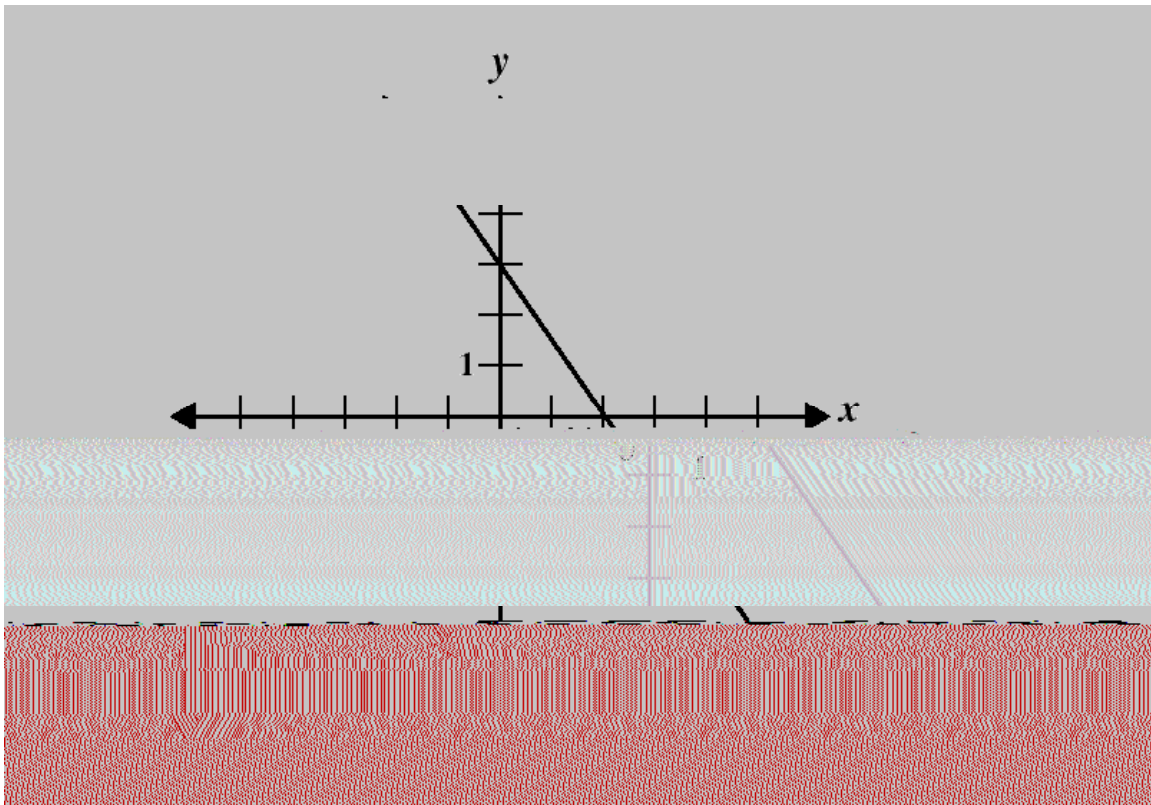
A $y = x - 1$

B $y = x + 1$

C $y = x + 3$

D $y = x - 3$

CAHSEE CST Released Item:



147. What is an equation of the line shown in the coordinate plane?

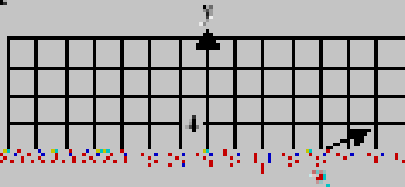
A $y = -\frac{3}{2}x + 3$

D $y = \frac{2}{3}x + 2$

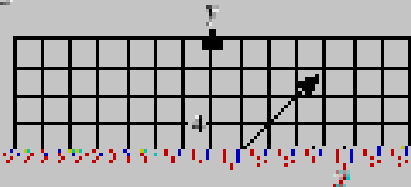
CAHSEE CST Released Item:

148. Which of the following is the graph of $y = \frac{1}{2}x + 2$?

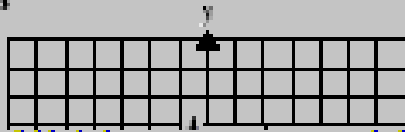
A



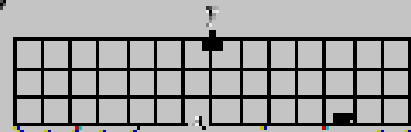
C



B



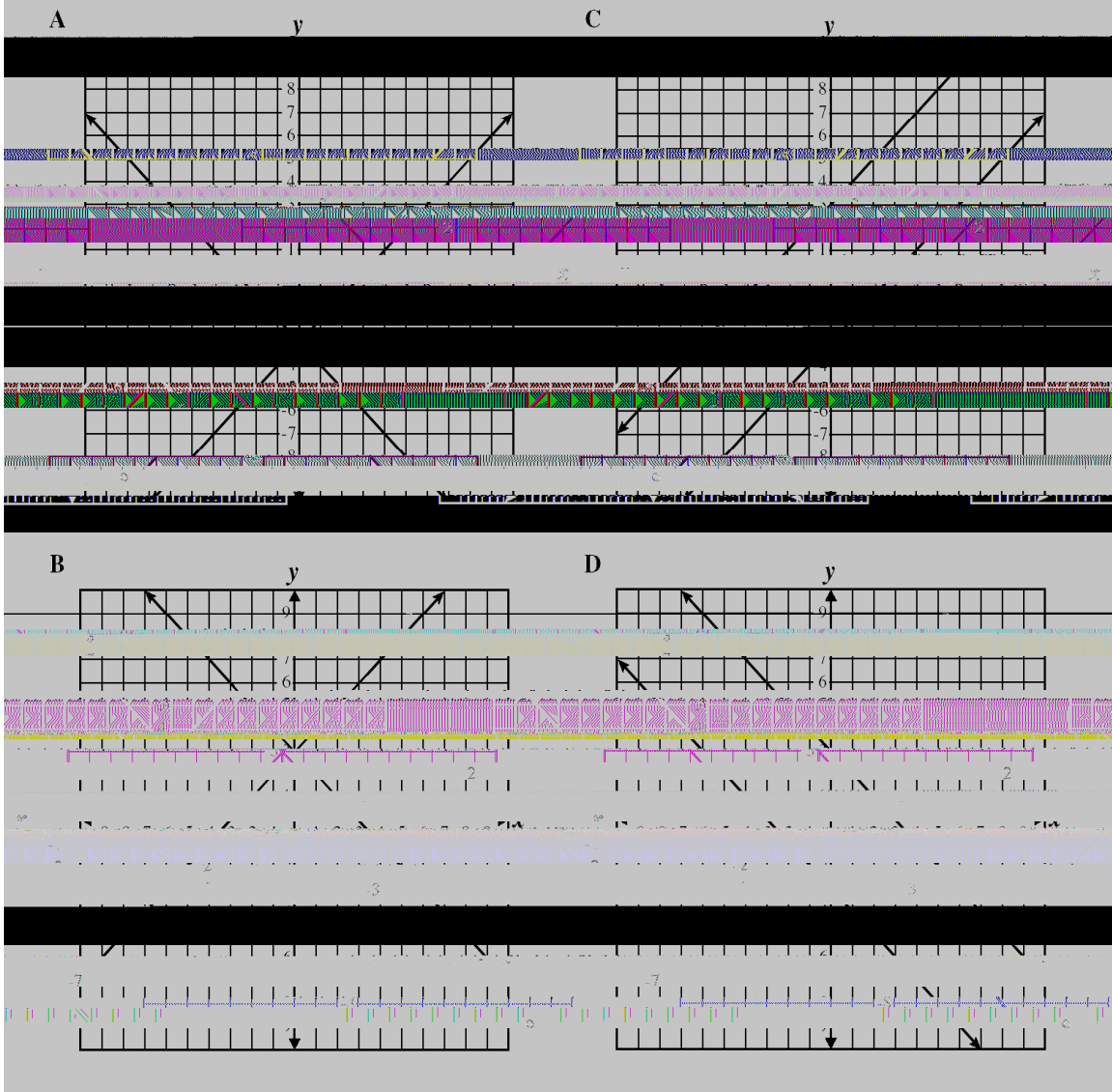
D



CAHSEE CST Released Item:

137. Which graph represents the system of equations shown below?

$$\begin{cases} y = -x + 3 \\ y = x + 3 \end{cases}$$



Algebra I CST Released Item:



