## Exploring Linear Functions                     For the Teacher

### *Objectives:*

Using the **LINEAR** aplet, the student will identify the slope and the y-intercept given a linear equation, and will describe the various effects positive, negative and zero values have on the graph.

### *Functionality:*

When the student selects  **START** , the **LINEAR NOTE** will be displayed.



The student should then go to the  **SKETCH**  for a visual explanation.



In order to adjust the values for *slope*, **M**, and the *y-intercept*, **B**, or to enter other values, the student should press   **VIEWS**  and make appropriate choices. The basic function **y = x** will appear in dot mode for comparison to the "adjusted" graph.



After the students have explored how M and B effect the graph, then they should select a  **Target**  .  The calculator will display the graph of a line.  The student should match the line by choosing values for M and B.



The students may also enter any value for M and B by selecting **Enter  M, B**  from the views menu. Input boxes will prompt the student to enter a value. The equation of the line will be shown at the top of the plot screen.



**Reset**   will return the values for M and B to the default values (M = 1, B = 0) and will plot the line.
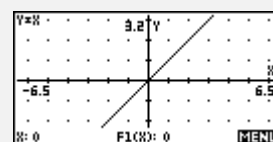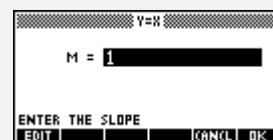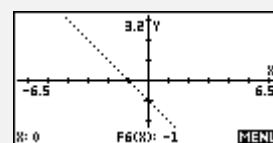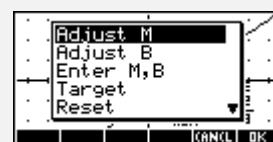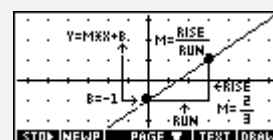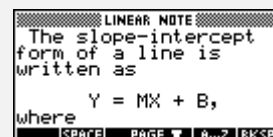


Notes:
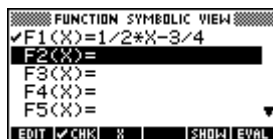- A more advanced form of this aplet, called **Linear Explorer**, is available from **The HP HOME view** at http://www.hphomeview.com
- A very advanced aplet, called **Quadratic Explorer**, is also available from the same site.  This aplet comes with student worksheets.

*Additional Exploration*:

Use the  **Build Your Own**  feature in the numeric setup of the Function aplet to have students create a table of x and y values for a given line.    An example would be:

Complete the table for $y = \dfrac{1}{2}x - \dfrac{3}{4}$.

| x | y |
|---|---|
| -5 | |
| -2 | |
| -1 | |
| 2 | |
| 7 | |
| 8 | |

```
▓▓▓▓FUNCTION SYMBOLIC VIEW▓▓▓▓
✓F1(X)=1/2*X-3/4
 F2(X)=
 F3(X)=
 F4(X)=
 F5(X)=                      ▼
 EDIT ✓CHK  X  |   |SHOW|EVAL
```

```
▓▓▓▓FUNCTION NUMERIC SETUP▓▓▓▓
NUMSTART: 0
NUMSTEP:  .1
NUMTYPE: Build Your Own
NUMZOOM:  4

CHOOSE TABLE FORMAT
       |CHOOS|    |PLOT▶|
```

```
    X  |  F1  |    |    |
 -5    |-3.25 |    |    |
 -2    |-1.75 |    |    |
 -1    |-1.25 |    |    |
  2    | .25  |    |    |
  7    |2.75  |    |    |
  8    |3.25  |    |    |
 1/2*X-3/4
 EDIT | INS |SORT| BIG |DEF ▪|
```

Programs associated with this aplet:
        .LIN.M, .LIN.B, .LIN.E, .LIN.T, .LIN.R, .LIN.S, .LIN.P, .LIN.SV

# Get In Line

Exploring Linear Functions

Name _____

Date _____

Directions: Using the **LINEAR** aplet, |**Reset**|, then return to |**VIEWS**| to adjust M and B in order to complete the activity. Complete the table, based upon different values for M.
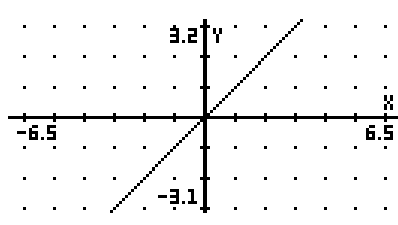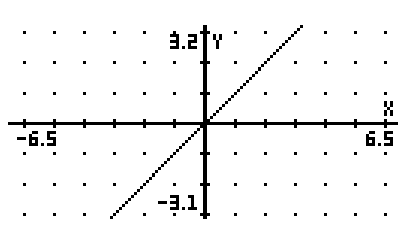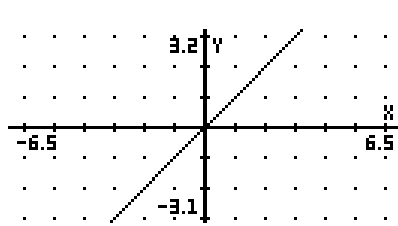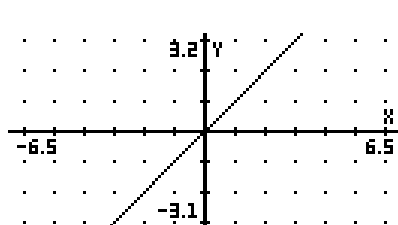
*Note: Line slant options are* L = left, R = right, H = horizontal, V = vertical.
*Slope options are* VS = very steep, S = steep, NS = not steep.

| If M value is... | the line slants ... | the slope is ... | graph relative to y = x |
|---|---|---|---|
| 1. $\dfrac{-5}{2}$ | | |  |
| 2. -1 | | |  |
| 3. $\dfrac{1}{2}$ | | |  |
| 4. 2 | | |  |

5. For values of M that are positive, the line slants _____.
   For negative values of M, the line slants _____.
   Predict what will happen if M is zero. The line is _____.

   Complete the table based upon different values for B.
   *Note: Line move options are* L = left, R = right, U = up, D = down.

| If B value is ... | the line moves ... | graph sketch relative to y = x |
|---|---|---|
| 5. $\frac{-5}{2}$ | |  |
| 6. -1 | |  |
| 7. $\frac{1}{2}$ | |  |
| 8. 2 | |  |

9.  For positive values of B, the line is shifted _____.
    For negative values of B, the line is shifted _____.
    The line is not shifted when the value of B is _____.

10. Describe what would happen if you put in a value for both M and B. Sketch at least two examples below.
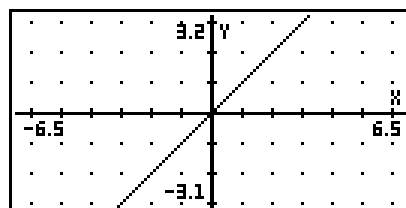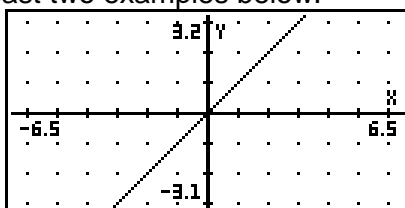
   

**What's My Line**
Exploring Linear Functions

Name _____
Date _____

Directions: Using the **LINEAR** aplet, $\boxed{\text{Reset}}$, then return to $\boxed{\text{VIEWS}}$ to enter M and B. For this matching activity, write the number of the graph that matches the equation in the space provided.
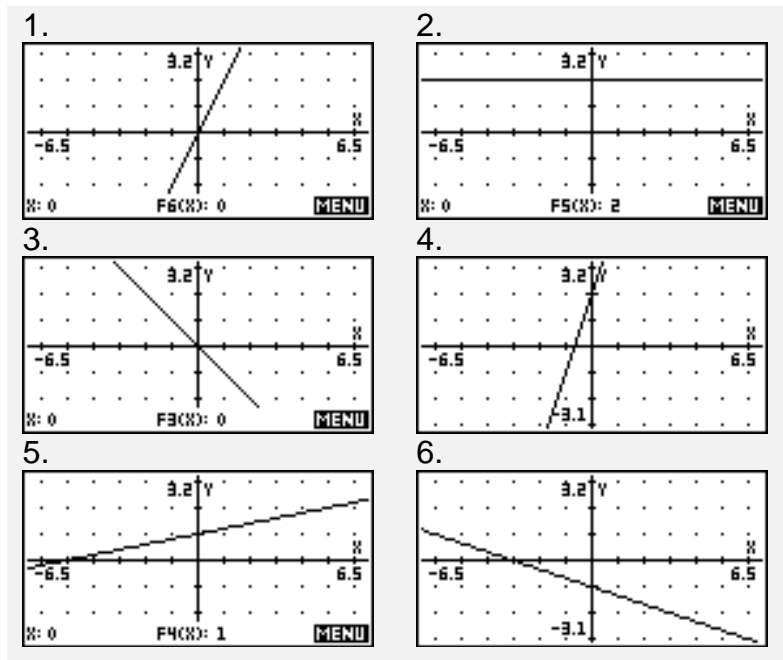
_____A. $y = 3x + 2$

_____B. $y = -\dfrac{1}{3}x - 1$

_____C. $y = -x$

_____D. $y = \dfrac{1}{5}x + 1$

_____E. $y = 2$

_____F. $y = 2x$

1.

| | |
|---|---|
| 3.2 Y | |
| -6.5 | 6.5 |
| X: 0   F6(X): 0 | MENU |

2.

| | |
|---|---|
| 3.2 Y | |
| -6.5 | 6.5 |
| X: 0   F5(X): 2 | MENU |

3.

| | |
|---|---|
| 3.2 Y | |
| -6.5 | 6.5 |
| X: 0   F3(X): 0 | MENU |

4.

| | |
|---|---|
| 3.2 Y | |
| -6.5 | 6.5 |
| -3.1 | |

5.

| | |
|---|---|
| 3.2 Y | |
| -6.5 | 6.5 |
| X: 0   F4(X): 1 | MENU |

6.

| | |
|---|---|
| 3.2 Y | |
| -6.5 | 6.5 |
| -3.1 | |

7. Using A - F, state the values for the slope and the y-intercept. Fill in the values in the table. Describe the shift of the line compared to y = x.

| Equation | slope (M) | y-intercept (B) | Describe shift |
|---|---|---|---|
| A | | | |
| B | | | |
| C | | | |
| D | | | |
| E | | | |
| F | | | |

8. Write an equation for the line having the given slope and y-intercepts.

| slope | y-intercept | equation of the line |
|---|---|---|
| 3 | -2 | |
| -2/5 | 0 | |
| -5 | 1/2 | |