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| **Problem 1 – Exploring Vertex Form** | |
| To get the Transformational Graphing Application started, press Œ and select **Transfrm.**  Now press o and enter **(X–B)²+C** to match the screen to the right. |  |
| Press q and select **ZStandard** to view the graph displayed in a normal window. Notice that the variables *B* and *C* are listed to the left along with the equation. |  |
| Change the values for *B* and *C* by using the } and † keys to select the variable to change and the  | and ~ keys to change the value. Make changes to *B* and *C* so that the graph of the parabola’s vertex will be in Quadrant I and write down the resulting equation in the table below. Find three other parabola equations whose vertices are also located in Quadrant I and record their equations in the table as well. Repeat this for the remaining three quadrants.   |  |  |  |  | | --- | --- | --- | --- | | **Quadrant I** | **Quadrant II** | **Quadrant III** | **Quadrant IV** | |  |  |  |  | |  |  |  |  | |  |  |  |  | |  |  |  |  |   Use the vertex form of the equations to answer the questions below.  **1.** In which quadrants is the value of *B* positive?  **2.** In which quadrants is the value of *C* positive? | |

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| **Problem 2 – Happy and Sad Parabolas** | | |
| “Happy” parabola | “Sad” parabola | |
| Press o and enter **AX²** to match the screen to the right. Then press s.  Make the “happy” parabola wider, narrower, and “sad” by changing the value of *A*.  Record four “happy” and four “sad” parabolas. | |  |
| |  |  | | --- | --- | | **“Happy” Parabolas** | **“Sad” Parabolas** | |  |  | |  |  | |  |  | |  |  |   **3.** How does the equation change when the parabola is wider or narrower?  **4.** For what values of *A* is the parabola “happy” (opens up) or “sad” (opens down)? | | |
| **5.** Is *f*(*x*) = 3.5(*x* – 2)2 + 5 a “happy” or “sad” parabola? How do you know?  **6.** Determine whether the following parabolas open up or down.  *a*(*x*) = 2.5*x*2 – 5 *c*(*x*) = –(*x* – 2)2 – 5  *b*(*x*) = 6 + 3(*x* – 3)2 *d*(*x*) = 7(*x* + 1)2 – 1 | | |
| **Extension – Parabola Hunt** | | |
| Enter the following data points into lists **L1** and **L2** of the graphing calculator by pressing … Í.  (–6, 4), (–2, –2), (4, –1), (6, 5) | |  |
| Now, set the calculator to graph these data points by pressing y o [stat plot], selecting **Plot1** and matching the screen to the right. | |  |
| Now press o and enter **A(X–B)²+C** next to Y1.  View the finished screen by pressing q and selecting **ZoomStat**. | |  |
| For each of the points given on the graph, find an equation of a “happy” parabola so that the vertex of the parabola is located at the given point. Then, find an equation of a “sad” parabola at each vertex point. Check your answer using your graphing calculator and values for *A* *B*, and *C*. | | |
| |  |  |  |  | | --- | --- | --- | --- | | **Point 1** | **Point 2** | **Point 3** | **Point 4** | |  |  |  |  | |  |  |  |  |   Compare your equations with a classmate. Using all of your equations listed above, rank the parabolas from widest to narrowest.  **Bonus Problem**  Find the equation of a parabola that passes through any two of the labeled points on the graph. | | |