Name: _____

OTL – Standard Form to Vertex Form, Day 2

1. Rewrite each relation in the form $y = a(x - h)^2 + k$ by completing the square.

   As you go, check that your work is correct using Desmos, by graphing both the original relation and the relation in $y = a(x - h)^2 + k$ form.

   a. $y = -x^2 - 10x - 9$

b. $y = -x^2 + 14x - 50$

c. $y = 2x^2 + 120x + 75$

d. $y = 3x^2 - 24x + 10$

e. $y = -5x^2 - 200x - 120$

2. Your friend says that:

> "Completing the square is a waste of time. You can always find the vertex of a quadratic by averaging the x-intercepts and then substituting back into the equation to get the y-value of the vertex."

Is your friend speaking truth?

That is, can you prove (or disprove) their conjecture?

Create example(s) to support your position.

3. Rewrite each relation in the form $y = a(x - h)^2 + k$ using whatever method you feel is most efficient.

   For each part, explain, in point-form, why you felt your approach was the most efficient.

   Check your work using Desmos.

   a. $y = x^2 + 17x + 30$

b. $y = 4x^2 - 16x + 12$

c. $y = -2x^2 - 3x + 9$

d. $y = -5x^2 - 30x - 48$

e. $y = -2x^2 - 3x + 7$

4. The cost, in dollars, of operating a machine per day is given by the formula
    $C = 2t^2 - 84t + 1025$, where t is the time, in hours, the machine operates, and C is the
    total cost, in dollars. What is the minimum cost of running the machine? For how many
    hours must the machine run to reach this minimum cost?

5. A quadratic relation has roots 0 and 6 and a maximum at (3, 4).

    Determine the equation of the relation using any method.