

## M201: Function Concepts Post-Badge Task

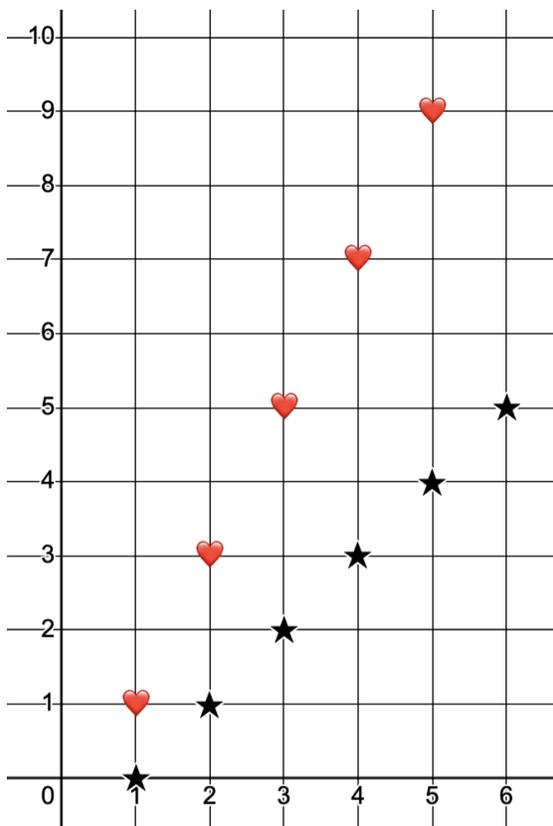
### Reflecting on Badge Learning

Now that you have learned more about function concepts, respond to the questions that follow. These are the same questions you responded to before the start of this badge.

### The Task

#### QUESTION 1

The figure shows the graphs of two functions—the Heart and Star functions. The Heart function is defined recursively by  $H(1) = 1$ ,  $H(n) = H(n - 1) + 2$ . Which choice defines the Star function? How do you know?



(a)  $S(1) = 0$ ,  $S(n) = S(n - 1) + 2$

(b)  $S(1) = 0$ ,  $S(n) = S(n - 1) + 1$

(c)  $S(0) = 1$ ,  $S(n) = S(n - 1) + 1$

I know that the first star is at the point  $(1, 0)$ , which means that 1 is the input and 0 is the output. This matches  $S(1) = 0$ . Also, each star is one unit higher than the one before it, so  $S(n)$  adds 1 to the one before.

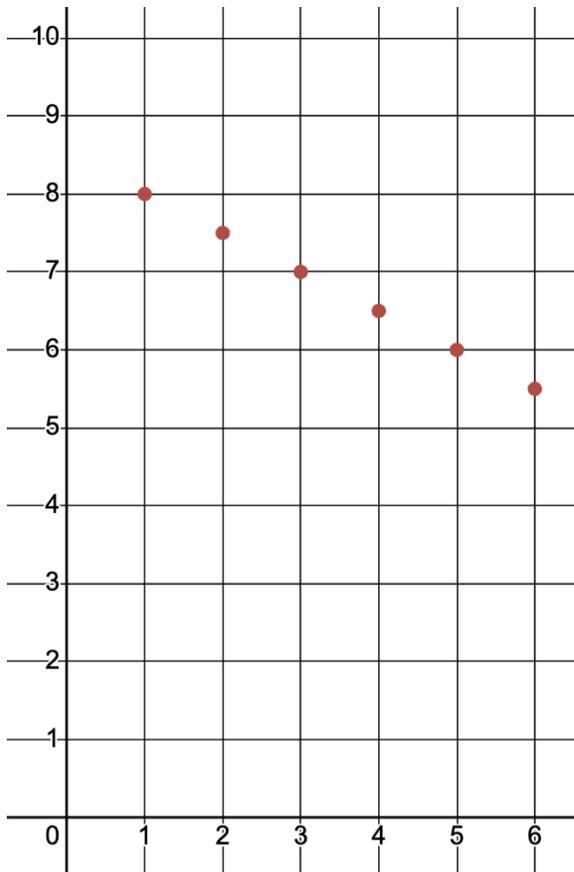
Graphics for this task here:

<https://www.desmos.com/calculator/mixy61gxxj>

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### QUESTION 2

The Dot Function is defined recursively by  $D(1) = 8$ ,  $D(n) = D(n - 1) - 0.5$ .  
Draw the graph of the Dot function on the grid provided.



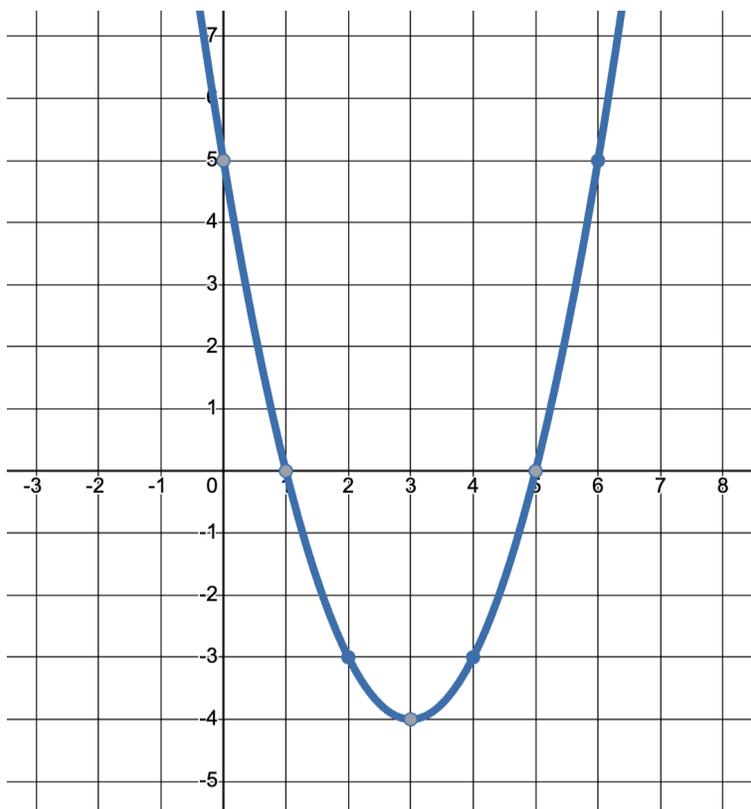
For which value of  $n$  will  $D(n) = 0$ ?  
Explain how you determined your answer.

I notice that the dots decrease by half a unit each time. Since the first dot ( $n = 1$ ) is at 8, it will take 16 times to decrease all the way to 0. Starting at  $n = 1$  and decreasing over 16 more times means  $D(n) = 0$  when  $n = 17$ .

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### QUESTION 3

The graph of  $f(x) = x^2 - 6x + 5$  is shown below. Express the function in factored form and vertex form.



Factored Form:

$$f(x) = (x - 5)(x - 1)$$

Vertex Form:

$$f(x) = (x - 3)^2 - 4$$

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### QUESTION 4

Three equivalent forms of quadratic function are given. Determine the vertex, x-intercepts and y-intercept of the graph. Then, draw the graph of the function.



Standard Form:

$$g(x) = x^2 + 2x - 8$$

Factored Form:

$$g(x) = (x - 2)(x + 4)$$

Vertex Form:

$$g(x) = (x + 1)^2 - 9$$

Vertex:

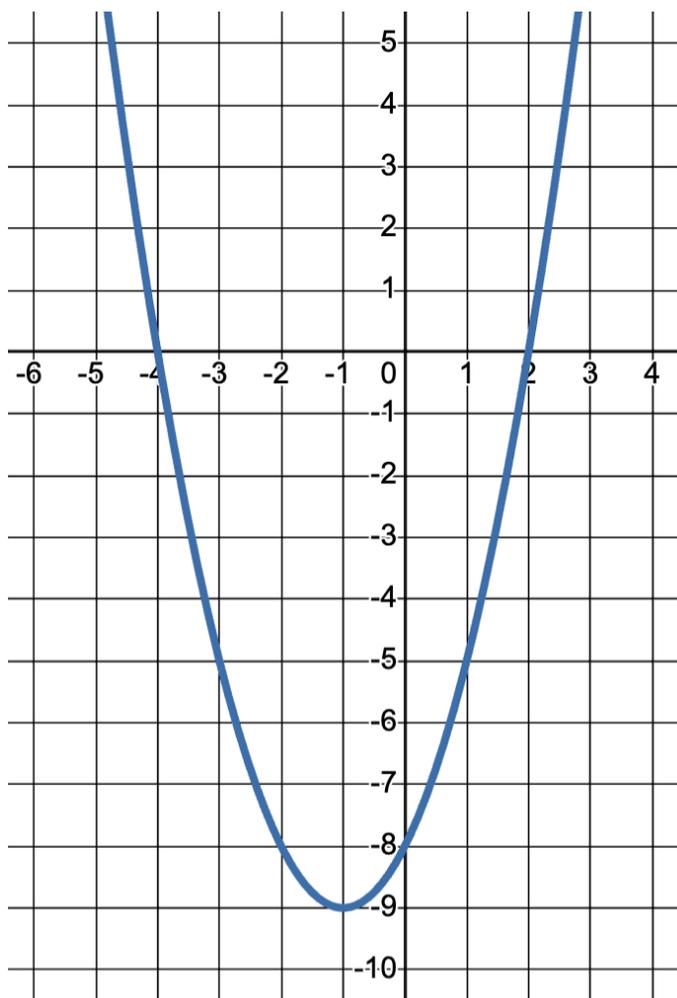
$$(-1, -9)$$

x-intercepts:

$$(2, 0) \text{ and } (-4, 0)$$

y-intercept:

$$(0, -8)$$



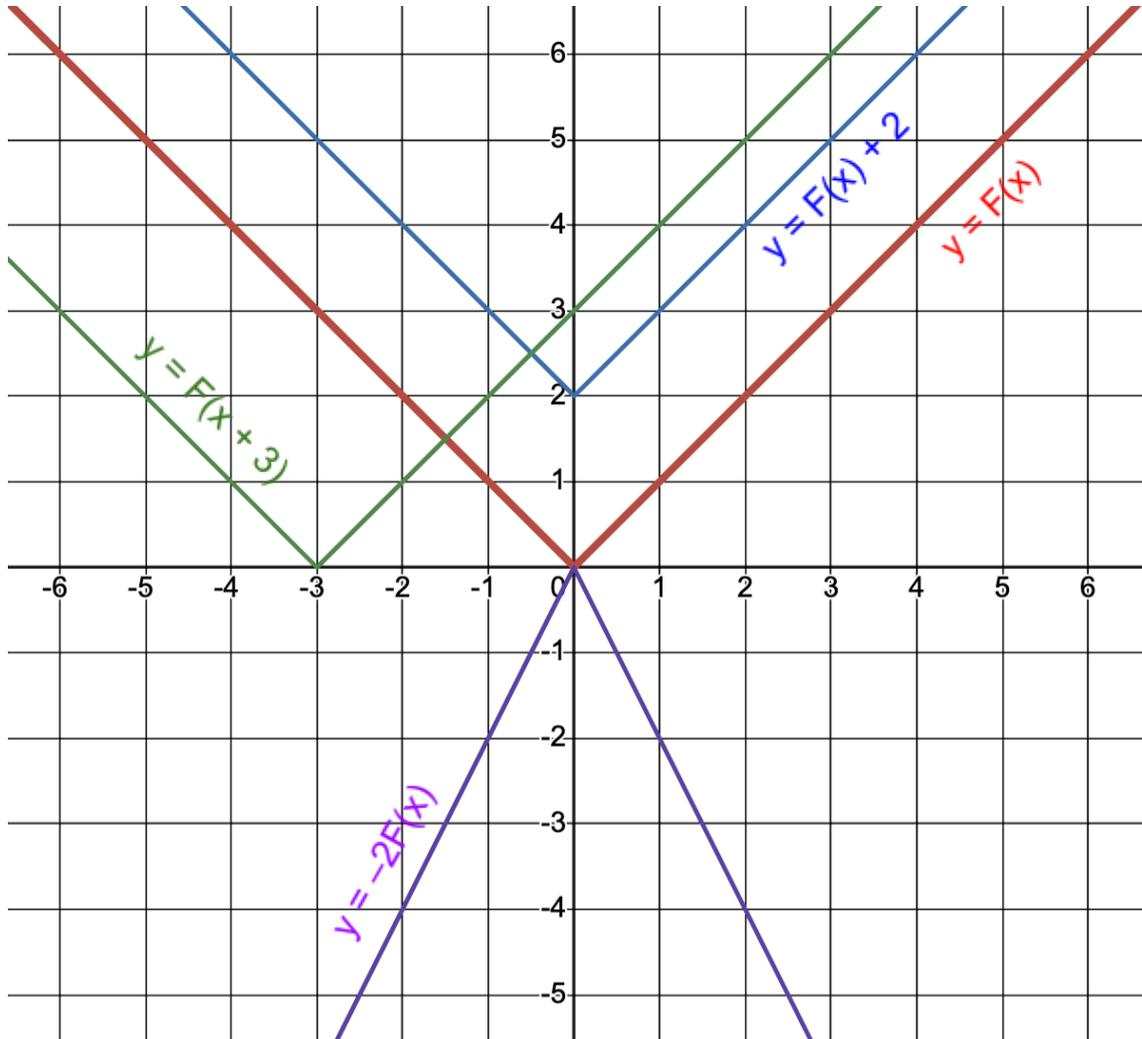
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## QUESTION 5

The figure shows the graph of  $F(x) = |x|$ . Draw the graph of each function:

- $y = F(x) + 2$
- $y = F(x + 3)$
- $y = -2F(x)$

Label each function on your graph.



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**QUESTION 6** What else did you learn that was not reflected in Questions 1-5?



*Answers will vary.*

**QUESTION 7** Compare your answers to these questions now to your answers from the earlier attempt. What do you notice about your progress?



*Answers will vary. Look for students to explain what they know now compared to what they knew when responding to the pre-test.*