

Investigation for geometric functions

1. Make a table of values for the function $y = x^2$ including the points $(-3, 9)$, $(-2, 4)$, $(0, 0)$, and $(3, 9)$. Graph the function $y = x^2$ on one of the graphs, making sure to make the graph pass at the points where $x = -3$ and 3 .
2. Make a table of values for the function $y = x^2 - 1$ including the points $(-3, 8)$, $(-2, 3)$, $(0, -1)$, and $(3, 8)$. On a second graph, graph the function $y = x^2 - 1$, making sure to make the graph pass at the points where $x = -3$, 0 , 3 , and 3 .
3. Make a table of values for the function $y = (x - 3)^2$ including the points $(3, 0)$, $(4, 1)$, and $(5, 4)$. On a third graph, graph the function $y = (x - 3)^2$, making sure to make the graph pass at the points where $x = 3$, 4 , 5 , and 6 .
4. On the first graph, set a vertical line through the line $x = 3$. Take the piece to the left of negative x and place into the third graph so that you have the graph of $y = x^2$ from $(-3, 9)$ to $(3, 9)$. Discard the right side of the graph.
5. On the second graph of $y = x^2 - 1$, set a vertical line through the line $x = 3$ with $x = 3$. Take the piece to the middle to between where $x = 3$ and 3 and place into the third graph so that you have the graph of $y = x^2 - 1$ from $(3, 8)$ to $(3, 8)$. Discard the left and right side of the graph.
6. On the third graph of $y = (x - 3)^2$, set a vertical line through the line $x = 3$. Take the piece to the right of 3 and place into the third graph so that you have the graph of $y = (x - 3)^2$ from $(3, 0)$ to $(5, 4)$. Discard the left side of the graph.
7. On the new graph, you have graphed the piecewise function, $f(x) = \begin{cases} x^2 & x < 3 \\ x^2 - 1 & 3 \leq x < 4 \\ (x - 3)^2 & x \geq 4 \end{cases}$

8. On a new set of graphs, go through the same process one get did with the following piecewise function.

$$f(x) = \begin{cases} x^2 + 4 & x < 3 \\ x^2 + 1 & 3 \leq x < 4 \\ x^2 & x \geq 4 \end{cases}$$

Problems

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