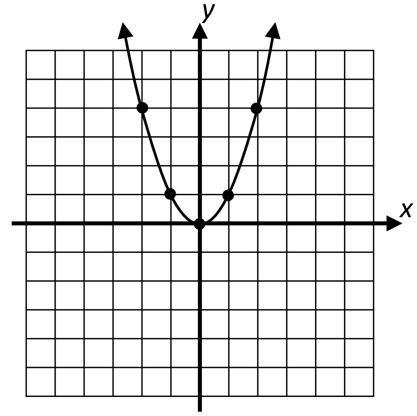
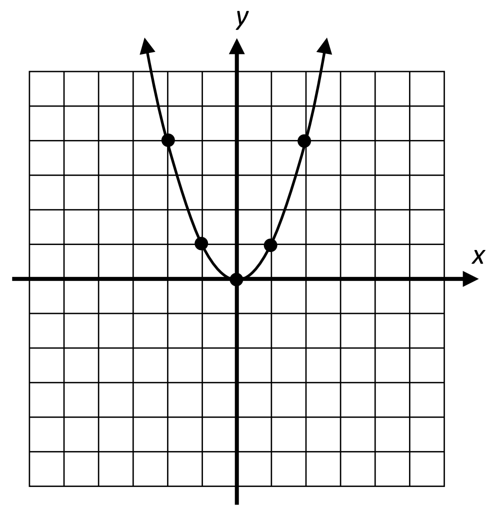
1. The grid below shows the graph of $y = x^2$ with particular points emphasized. On the same grid, draw the following **quadratic functions**. Try to do these as best as possible without using your calculator and then check your answers. Label each with its letter or equation.



(a) $y = x^2 - 6$ (b) $y = x^2 + 1$

(c) $y = (x+3)^2$ (d) $y = (x-4)^2$

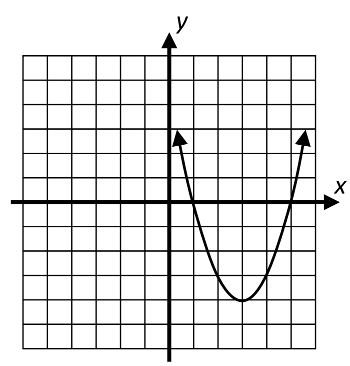
2. Again, the function $y = x^2$ is shown below. Graph each of the following more complicated quadratics without the use of your calculator. Then, use it to check that you have shifted the correct amounts. Label each with its letter or equation.



(a) $y = (x-1)^2 - 4$

(b) $y = (x+3)^2 - 1$

3. Which of the following equations represents the graph shown below given that it is a shift of the function $y = x^2$. Explain your choice.



(1) $y = (x-3)^2 - 4$

(2) $y = (x+3)^2 - 4$

(3) $y = (x-3)^2 + 4$

(4) $y = (x+3)^2 + 4$

4. State the turning points for each of the following quadratic functions and state whether the parabola opens upwards or downwards. Remember, the direction it opens only depends on the leading coefficient.

(a) $y = 4(x-2)^2 + 7$ (b) $y = -3(x+6)^2 + 4$ (c) $y = -(x+4)^2 - 3$

* (d) $y = \frac{1}{2}(x+1)^2 - 7$ * (e) $y = 9 - x^2$ * (f) $y = -16(x-5)^2 + 11$

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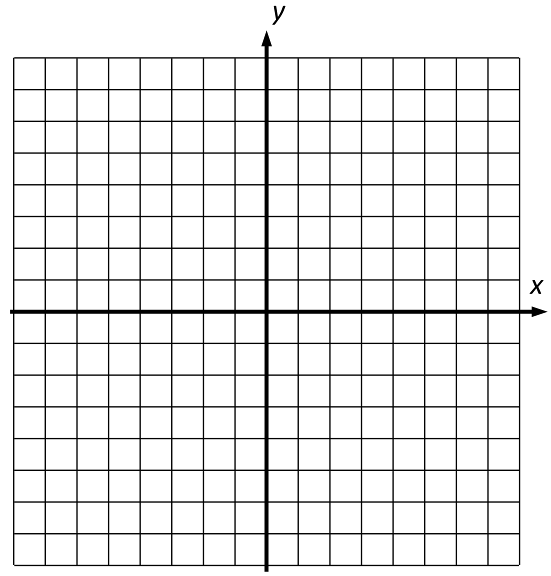
* R1. The cost per computer produced at a factory depends on how many computers the factory produces in a day. The cost function is modeled by $C(n)=\frac{1}{500}n^2-n+200$, where n is the number of computers produced in a day and $C(n)$ is the unit cost, in dollars per computer.

(a) Calculate $C(50)$ and give an interpretation of your answer in terms of the scenario described.

(b) Does the cost have a minimum or maximum value? Explain. Use your calculator to find it.

(c) Based on (b), can this function have any real zeroes? Explain your thought process.

R2. Consider the function $f(x)=x^2+2x-3$.



(a) Using your calculator, create an accurate graph of $f(x)$ on the grid provided.

(b) State the coordinates of the turning point of $f(x)$. Is this point a maximum or minimum?

(c) State the range of this quadratic function.

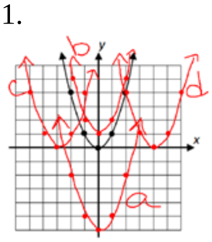
(d) State the **zeroes** of this function (the *x*-intercepts).

(e) Over what interval is this function **negative**? In other words, over what *x*-values is the output (or *y*-value) to this function negative?

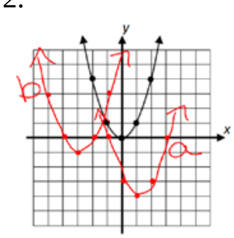
(f) Over what interval is this function **increasing**?

(g) Determine the average rate of change of this function over the interval $-2 \le x \le 4$.

1.



2.

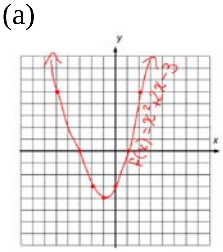


3. (1)

4. (a) (2, 7) Up
   (b) (-6, 4) Down
   (c) (-4, -3) Down
   (d) (-1, -7) Up
   (e) (0, 9) Down
   (f) (5, 11) Down

R1. (a) C(50) = 155, when producing 50 computers the cost per computer is $155
(b) Minimum (250, 75)
(c) No, the smallest output is 75

R2. (a)



(b) (-1, -4) minimum
(c) $y \ge -4$
(d) -3 and 1
(e) $-3 < x < 1$
(f) $-1 < x < \infty$
(g) 4