Name: ________________________________

Determining Points on a Quadratic (x^2) Equation

When you are plugging **input values** (x) into a quadratic equation, it is vital that you follow the **order of operations** (parentheses, exponent, multiplication/division, addition/subtraction) as you solve. If you solve parts out of order, the **output values** (*y)* will be incorrect.

The ***x*-values** that you choose to plug in are **input values** and are part of the **domain**. The ***y*-values** that result are **output values** and are part of the **range**.

<table>
<tr><th>Equation:</th><th>Determine points and write them</th><th>…as an XY Table…</th><th>…and as a list of points.</th><th>Critical Thinking Questions:</th></tr>
<tr>
<td>Example
$f(x) = 6x^2 - 3x + 10$
is the same as:
$\boldsymbol{y} = 6x^2 - 3x + 10$

If $x = -5 \rightarrow y = 6(-5)^2 - 3(-5) + 10$
$y = 6(25) + 15 + 10$
$y = 150 + 15 + 10 = \boxed{175}$

If $x = 4 \rightarrow y = 6(4)^2 - 3(4) + 10$
$y = 6(16) - 12 + 10$
$y = 96 - 12 + 10 = \boxed{94}$

If $x = 0 \rightarrow y = 6(0)^2 - 3(0) + 10$
$y = 0 - 0 + 10 = \boxed{10}$

If $x = -3 \rightarrow y = 6(-3)^2 - 3(-3) + 10$
$y = 6(9) + 9 + 10$
$y = 54 + 9 + 10 = \boxed{73}$

If $x = 1 \rightarrow y = 6(1)^2 - 3(1) + 10$
$y = 6(1) - 3 + 10$
$y = 6 - 3 + 10 = \boxed{13}$</td>
<td>I can pick any x that I want, so I'm going to pick numbers close to zero to make squaring easier.

If x = <u>-5</u>, then y = <u>175.</u>
If x = <u>4</u>, then y = <u>94</u>.
If x = <u>0</u>, then y = <u>10</u>.
If x = <u>-3</u>, then y = <u>73</u>.
If x = <u>1,</u> then y = <u>13</u></td>
<td><table><tr><th><u>Domain</u>
x</th><th><u>Range</u>
y</th></tr><tr><td>Write x's from lowest to highest</td><td></td></tr><tr><td>-5</td><td>175</td></tr><tr><td>-3</td><td>73</td></tr><tr><td>0</td><td>10</td></tr><tr><td>1</td><td>13</td></tr><tr><td>4</td><td>94</td></tr></table></td>
<td>Write as (x, y) points in order from least x to greatest x.

$\{(-5, 175), (-3, 73), (0, 10), (1, 13), (4, 94)\}$</td>
<td><u>Limits on the Domain</u>
Is there anything that x CANNOT ever be? If yes, what?
I can plug in any x be able to solve it. There are no limits to this domain.
<u>Limits on the Range</u>
Is there anything that y CANNOT ever be?
The y-values get bigger in both directions that x grows. It turns around between x= -3 and x= 1, close to the zero. I don't know what the lowest y value will be, because it might be a decimal, but the lowest output I can find is y= 10 (from the input x= 0), because at x= -1, y= 19 and at x= 1, y= 13.</td>
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<tr>
<td>Example
$p(x) = -(x + 8)^2 + 1$
$\boldsymbol{y} = -(x + 8)^2 + 1$

If $x = -10 \rightarrow y = -((-10) + 8)^2 + 1$
$y = -(-2)^2 + 1 = -(4) + 1 = \boxed{-3}$

If $x = 1 \rightarrow y = -((1) + 8)^2 + 1$
$y = -(9)^2 + 1 = -(81) + 1 = \boxed{-80}$

If $x = 0 \rightarrow y = -((0) + 8)^2 + 1$
$y = -(8)^2 + 1 = -(64) + 1 = \boxed{-63}$

If $x = -7 \rightarrow y = -((-7) + 8)^2 + 1$
$y = -(1)^2 + 1 = -(1) + 1 = \boxed{0}$

If $x = 2 \rightarrow y = -((2) + 8)^2 + 1$
$y = -(10)^2 + 1 = -(100) + 1 = \boxed{-99}$</td>
<td>I'm going to pick negative numbers that, when I add 8, will make small numbers to make squaring easier. I'll also use two small positive numbers and 0.

If x = <u>-10</u>, then y = <u>-3.</u>
If x = <u>1</u>, then y = <u>-80</u>.
If x = <u>0</u>, then y = <u>-63</u>
If x = <u>-7</u>, then y = <u>0</u>.
If x = <u>2,</u> then y = <u>-99</u>.</td>
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x</th><th><u>Range</u>
y</th></tr><tr><td>-10</td><td>-3</td></tr><tr><td>-7</td><td>0</td></tr><tr><td>0</td><td>-63</td></tr><tr><td>1</td><td>-80</td></tr><tr><td>2</td><td>-99</td></tr></table></td>
<td>$\{(-10, -3), (-7, 0), (0, -63), (1, -80), (2, -99)\}$</td>
<td><u>Limits on the Domain</u>
Is there anything that x CANNOT ever be? If yes, what?
I can plug in any x be able to solve it. There are no limits to this domain.
<u>Limits on the Range</u>
Is there anything that y CANNOT ever be?
Y gets smaller both when x grows negatively and positively, and it seems to turn around near x= -7. On my points, (-7,0) is as high as y gets. If I plug in x= -8, then y=1, but for x= -9, y= 0 again, so I think the turning point is at (-8, 1). I don't think the range can get any higher than y= 1.</td>
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</table>

1. $f(x) = -2x^2 - 10x + 5$	Input Output If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ .	Domain x | Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?
2. $w(x) = 3(x - 7)(x + 4)$	Input Output If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ .	Domain x | Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?
3. $t(x) = 4x^2 - 9x - 2$	Input Output If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ .	Domain x | Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?

4. $b(x) = 2(x-7)^2 + 5$	Input Output If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ .	Domain x Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?
5. $k(x) = -9(x-2)^2 + 8$	Input Output If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ .	Domain x Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?
6. $c(x) = -4x^2 - 2x - 9$	Input Output If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ . If x = __________ , then y = __________ .	Domain x Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?

7. $a(x) = 2(x-6)(x-9)$	Input Output If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ .	Domain x | Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?
8. $q(x) = -(x+11)^2 - 4$	Input Output If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ .	Domain x | Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?
9. $h(x) = 9(x+1)(x+7)$	Input Output If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ . If x = ________ , then y = ________ .	Domain x | Range y	{(,), (,), (,), (,), (,)}	Limits on the **Domain** Is there anything that ***x*** CANNOT ever be? If yes, what? Limits on the **Range** Is there anything that ***y*** CANNOT ever be?