

Name: \_\_\_\_\_ Page Number: 1  
 Class: Math 1301 Date: 3-26-13  
 Topic/Section: Quadratic Functions

| Examples and Vocabulary                                                                                                                                                                              | Notes/Comments/Questions |
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| <h2 style="text-align: center;"><u>Fundamental Properties of Quadratic Functions or Parabolas</u></h2>                                                                                               |                          |
| <p>① Formula can be written as</p> $y = f(x) = ax^2 + bx + c, a \neq 0$ <p><math>a</math> is called the <u>leading coefficient</u><br/> <math>c</math> is called the <u>constant coefficient</u></p> |                          |
| <p>② domain = all real numbers</p>                                                                                                                                                                   |                          |
| <p>③ <math>y\text{-int.} = c = f(0) = a \cdot 0^2 + b \cdot 0 + c</math></p>                                                                                                                         |                          |
| <p>④ The graph of a quadratic function is a bowl-shaped called <u>parabola</u>.</p>                                                                                                                  |                          |

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| Examples and Vocabulary                                                                                                                                  | Notes/Comments/Questions |
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| <p>⑤ If <math>a &gt; 0</math>, the parabola opens upward <math>\cup</math>. If <math>a &lt; 0</math>, the parabola opens downward <math>\cap</math>.</p> |                          |
| <p>⑥ vertex = <math>\left( \frac{-b}{2a}, f\left(\frac{-b}{2a}\right) \right)</math></p>                                                                 |                          |
| <p>⑦</p>                                                                                                                                                 |                          |
| <p>⑧</p>                                                                                                                                                 |                          |
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| Examples and Vocabulary                                                                                                            | Notes/Comments/Questions |
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| ① Which of the following functions are quadratic?                                                                                  |                          |
| a. $\checkmark f(x) = 2x^2 - 4x - 1$<br>$a=2, b=-4, c=-1$                                                                          |                          |
| b. $\checkmark g(x) = (2-x)(3+x) = 6+2x-3x-x^2$<br>$a=-1, b=-1, c=6 = 6-x-x^2$                                                     |                          |
| c. $\checkmark h(x) = \frac{x^2}{3} + \frac{2x}{3} + 1 = \frac{1}{3}x^2 + \frac{2}{3}x + 1$<br>$a=\frac{1}{3}, b=\frac{2}{3}, c=1$ |                          |
| d. $\times F(x) = 3 - 2^2x = 3 - 4x$                                                                                               |                          |
| e. $\times G(x) = \sqrt[3]{x^2} - 7x + 2$<br>$= x^{2/3} - 7x + 2$                                                                  |                          |
| f. $\checkmark k(x) = -\frac{1}{2}x^2 - x + 2$<br>$a=-1/2, b=-1, c=2$                                                              |                          |

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| Examples and Vocabulary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Notes/Comments/Questions                                                     |
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| <p>② A baseball is popped up with an initial velocity of 80 feet per sec. The height <math>h</math> of the ball after <math>t</math> elapsed seconds is given by</p> $h = -16t^2 + 80t + 3$ <p>a. What is the height of the ball after 2 sec? 99 ft</p> $h(2) = -16(2)^2 + 80(2) + 3 = -16(4) + 160 + 3$ $= -64 + 160 + 3 = 99$ <p>b. What is the maximum height of the ball? 103 ft</p> $\text{vertex} = \left( \frac{-80}{2(-16)} = \frac{-80}{-32} = 2.5, \right.$ $h(2.5) = 103 = (2.5, 103)$ <p>c. When does the ball hit the ground?</p> | <p><math>a = -16</math><br/> <math>b = 80</math><br/> <math>c = 3</math></p> |



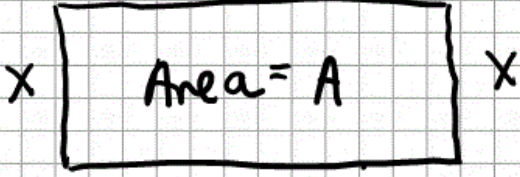
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| Examples and Vocabulary                                                                                                                                                                                                                                                                                                                                             | Notes/Comments/Questions |
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| <p>③ Benny sells sandals at a souvenir shop near the beach. The monthly profit <math>P</math> (in hundreds of dollars) from the sale of the sandals is given by the formula</p> $P = 12x - 3x^2 - 9$ <p>where <math>x</math> is the monthly demand (in hundreds of pairs).</p> <p>a. What is Benny's maximum profit? What demand results in the maximum profit?</p> |                          |

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| Examples and Vocabulary                                                                                                                                                                    | Notes/Comments/Questions |
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| <p>c. What are Benny's break-even points?</p>                                                                                                                                              |                          |
| <p>④ UTD has purchased 2400 ft of fencing to fence in a gator corral (rectangular).</p> <p>a. Find a function that models the area of the corral in terms of the width <math>x</math>.</p> |                          |

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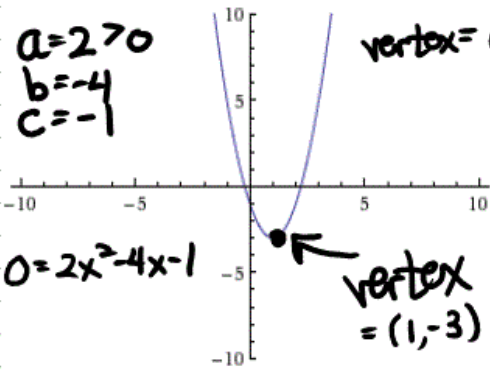
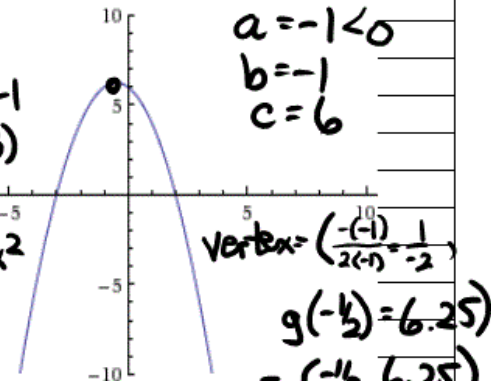
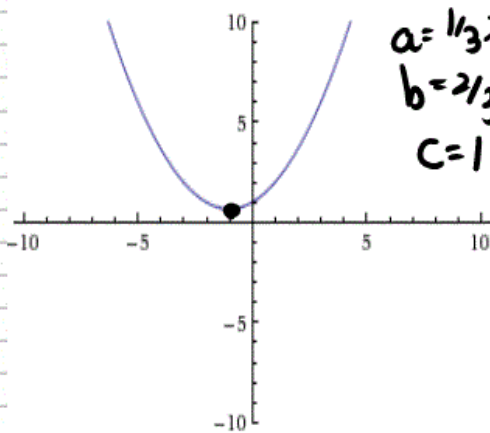
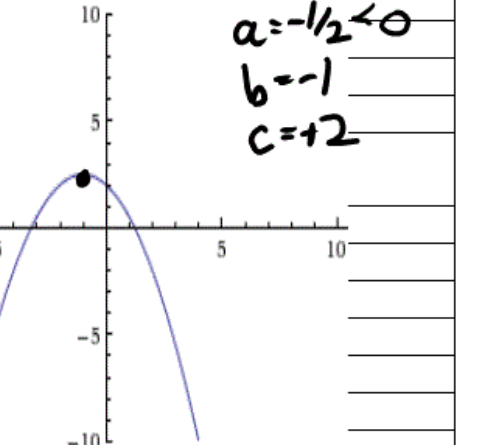
| Examples and Vocabulary                                                                                                                                                                            | Notes/Comments/Questions |
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|  <p data-bbox="232 657 902 926">b. Find the dimensions of the rectangle that maximize the area of the corral.</p> |                          |

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| Examples and Vocabulary                                                                                                                                                                                                                                                                                                | Notes/Comments/Questions |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
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| <p>⑤ The following table shows the percentage <math>y</math> of adult women working, <math>x</math> years after 1950. Find a quadratic function that fits the scatter plot of this data.</p>                                                                                                                           |                          |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
| <table border="1"> <thead> <tr> <th><math>x</math></th><th><math>y</math></th></tr> </thead> <tbody> <tr><td>12</td><td>38</td></tr> <tr><td>22</td><td>43</td></tr> <tr><td>32</td><td>52</td></tr> <tr><td>42</td><td>57</td></tr> <tr><td>52</td><td>60</td></tr> <tr><td>62</td><td>57</td></tr> </tbody> </table> | $x$                      | $y$ | 12 | 38 | 22 | 43 | 32 | 52 | 42 | 57 | 52 | 60 | 62 | 57 | $y = -0.114286x^2 + 1.27714x + 22.8914$ |
| $x$                                                                                                                                                                                                                                                                                                                    | $y$                      |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
| 12                                                                                                                                                                                                                                                                                                                     | 38                       |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
| 22                                                                                                                                                                                                                                                                                                                     | 43                       |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
| 32                                                                                                                                                                                                                                                                                                                     | 52                       |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
| 42                                                                                                                                                                                                                                                                                                                     | 57                       |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
| 52                                                                                                                                                                                                                                                                                                                     | 60                       |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |
| 62                                                                                                                                                                                                                                                                                                                     | 57                       |     |    |    |    |    |    |    |    |    |    |    |    |    |                                         |



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| Examples and Vocabulary                                                                                                                                                                                                                                                                                                                                                                                                                                | Notes/Comments/Questions                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <p>a. <math>f(x) = 2x^2 - 4x - 1</math></p> <p><math>a=2 &gt; 0</math><br/> <math>b=-4</math><br/> <math>c=-1</math></p>  <p>vertex = <math>\left(\frac{-(-4)}{2 \cdot 2} = 1, \frac{f(1)}{2 \cdot 2} = -3\right)</math></p> <p><math>f(1) = 2(1)^2 - 4(1) - 1 = 2 - 4 - 1 = -3</math></p> <p><math>0 = 2x^2 - 4x - 1</math></p> <p>vertex = <math>(1, -3)</math></p> | <p>b. <math>g(x) = 6 - x - x^2</math></p> <p><math>a=-1 &lt; 0</math><br/> <math>b=-1</math><br/> <math>c=6</math></p>  <p>vertex = <math>\left(\frac{-(-1)}{2(-1)} = -\frac{1}{2}, \frac{g(-1/2)}{2(-1)} = 6.25\right)</math></p> <p><math>g(-1/2) = 6.25</math></p> <p><math>0 = 6 - x - x^2</math></p> <p>vertex = <math>(-1/2, 6.25)</math></p> |
| <p>c. <math>h(x) = \frac{x^2}{3} + \frac{2x}{3} + 1</math></p> <p><math>a=1/3 &gt; 0</math><br/> <math>b=2/3</math><br/> <math>c=1</math></p>                                                                                                                                                                                                                        | <p>f. <math>k(x) = -\frac{1}{2}x^2 - x + 2</math></p> <p><math>a=-1/2 &lt; 0</math><br/> <math>b=-1</math><br/> <math>c=+2</math></p>                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                       |