

12.2 Quadratic Functions Test Review

Part II - Working with Functions

Intercept/Factored Form:

1. Find the roots/x-intercepts and describe the concavity

$y = (x + 4)(2x - 5)$ <p>X-int: make $y = 0$</p> $(x + 4)(2x - 5) = 0$ $x + 4 = 0 \quad \text{or} \quad 2x - 5 = 0$ $x = -4 \qquad \qquad \qquad 2x = 5$ $\qquad \qquad \qquad \qquad \qquad x = \frac{5}{2}$ $x = \left\{ -4, \frac{5}{2} \right\} \quad \text{CONCAVE UP}$	$y = -3(x + 1)(x + 10)$ $-3(x + 1)(x + 10) = 0$ $x + 1 = 0 \quad \text{or} \quad x + 10 = 0$ $x = -1 \qquad \qquad \qquad x = -10$ $x = \left\{ -1, -10 \right\} \quad \text{CONCAVE DOWN}$
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2. Find the vertex

$y = (x - 4)(x - 10)$ <p>roots: $x = \{4, 10\}$</p> <p>axis of symmetry: $\frac{4 + 10}{2} = \frac{14}{2} = 7$</p> <p>y-coord: $y = (7 - 4)(7 - 10)$</p> $y = (3)(-3)$ $y = (-9) \quad \boxed{(7, -9)}$	$y = -3(x + 1)(x - 5)$ <p>roots: $x = \{-1, 5\}$</p> <p>axis of sym.: $\frac{-1 + 5}{2} = \frac{4}{2} = 2$</p> <p>y-coord: $y = -3(2 + 1)(2 - 5)$</p> $y = -3(3)(-3)$ $y = 27 \quad \boxed{(2, 27)}$
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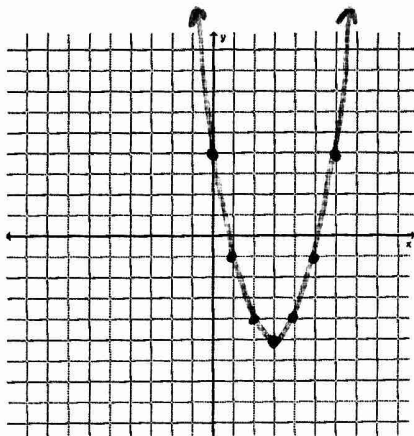
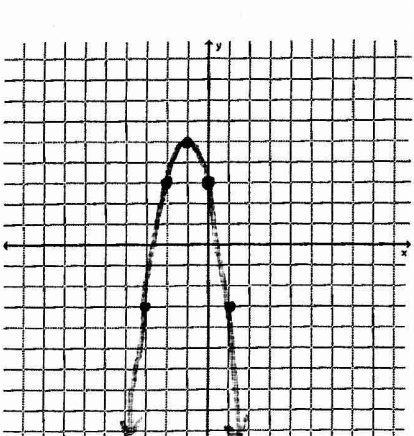
Standard Form:

3. Find the y-intercept and describe the concavity

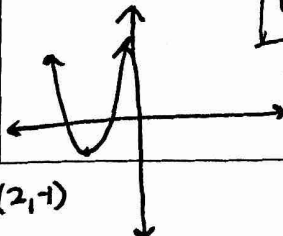
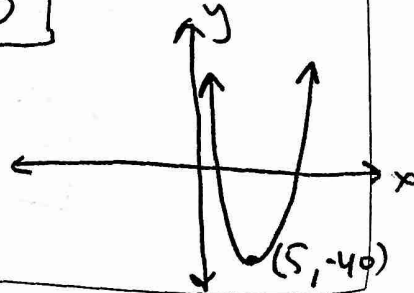
$y = 3x^2 + 7x - 19$ <p>Concave UP</p> <p>y-int: make $x = 0$</p> $y = 3(0)^2 + 7(0) - 19$ $y = -19$ $\boxed{(0, -19)}$	$y = x^2 - 5x + 2$ <p>Concave UP</p> <p>y-int: make $x = 0$</p> $y = 0^2 - 5(0) + 2$ $y = 2$ $\boxed{(0, 2)}$
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Vertex Form:

4. Graph Precisely and Analyze

<p>$y = (x - 3)^2 - 5$</p> <p>Vertex: (max or min?) MIN (3, -5)</p> <p>Axis of symmetry: X = 3</p> 	<p>$y = -2(x + 1)^2 + 5$</p> <p>Vertex: (max or min?) MAX (-1, 5)</p> <p>Axis of symmetry: X = -1</p> 
<p>Domain \mathbb{R} Range $y \geq -5$</p> <p>Increasing on $x > 3$ Decreasing on $x < 3$</p> <p>y-intercept: (0, 4) Check: $y = (0 - 3)^2 - 5$ $y = 9 - 5$ $y = 4 \checkmark$</p>	<p>Domain \mathbb{R} Range $y \leq 5$</p> <p>Increasing on $x < -1$ Decreasing on $x > -1$</p> <p>y-intercept: (0, 3) Check: $y = -2(0 + 1)^2 + 5$ $y = -2 + 5$ $y = 3 \checkmark$</p>

5. Rewrite in vertex form, then sketch the graph

<p>$y = (x + 3)(x + 1)$</p> <p>This is in <u>FACTORED</u> form to begin with... Change to <u>standard</u> first...</p> <table style="margin-left: 20px;"> <tr><td style="padding: 0 10px;">x</td><td style="padding: 0 10px;">3</td><td></td></tr> <tr><td style="padding: 0 10px;">x</td><td style="border: 1px solid black; padding: 2px;">x^2</td><td style="border: 1px solid black; padding: 2px;">$3x$</td></tr> <tr><td style="padding: 0 10px;">1</td><td style="border: 1px solid black; padding: 2px;">x</td><td style="border: 1px solid black; padding: 2px;">3</td></tr> </table> <p>$y = x^2 + 3x + x + 3$ $y = x^2 + 4x + 3$</p> <p>Now <u>complete the square</u></p> <table style="margin-left: 20px;"> <tr><td style="padding: 0 10px;">x</td><td style="padding: 0 10px;">$\frac{2}{2}$</td><td></td></tr> <tr><td style="padding: 0 10px;">x</td><td style="border: 1px solid black; padding: 2px;">x^2</td><td style="border: 1px solid black; padding: 2px;">$2x$</td></tr> <tr><td style="padding: 0 10px;">2</td><td style="border: 1px solid black; padding: 2px;">$2x$</td><td style="border: 1px solid black; padding: 2px;">4</td></tr> </table> <p>$y = (x^2 + 4x) + 3$ $y = (x^2 + 4x + 4) + 3 - 4$ $y = (x + 2)^2 - 1$</p>  <p>(-2, -1)</p>	x	3		x	x^2	$3x$	1	x	3	x	$\frac{2}{2}$		x	x^2	$2x$	2	$2x$	4	<p>$y = 2x^2 - 20x + 10$</p> <p>This is in <u>STANDARD</u> form to begin with... <u>Factor out 2</u>...</p> <p>$y = 2(x^2 - 10x) + 10$</p> <p><u>Complete the square</u></p> <table style="margin-left: 20px;"> <tr><td style="padding: 0 10px;">x</td><td style="padding: 0 10px;">-5</td><td></td></tr> <tr><td style="padding: 0 10px;">x</td><td style="border: 1px solid black; padding: 2px;">x^2</td><td style="border: 1px solid black; padding: 2px;">$-5x$</td></tr> <tr><td style="padding: 0 10px;">-5</td><td style="border: 1px solid black; padding: 2px;">$-5x$</td><td style="border: 1px solid black; padding: 2px;">25</td></tr> </table> <p>$y = 2(x^2 - 10x + 25) + 10 - 50$ $y = 2(x - 5)^2 - 40$</p>  <p>(5, -40)</p>	x	-5		x	x^2	$-5x$	-5	$-5x$	25
x	3																											
x	x^2	$3x$																										
1	x	3																										
x	$\frac{2}{2}$																											
x	x^2	$2x$																										
2	$2x$	4																										
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