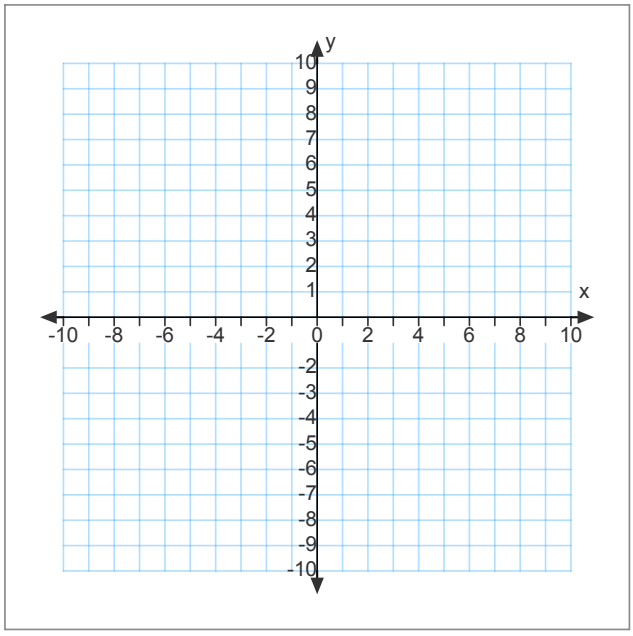
Quadratics Review

For each function below state the direction of the opening, the vertex, axis of symmetry, max or min value, and the domain and range. Finally, sketch the function.

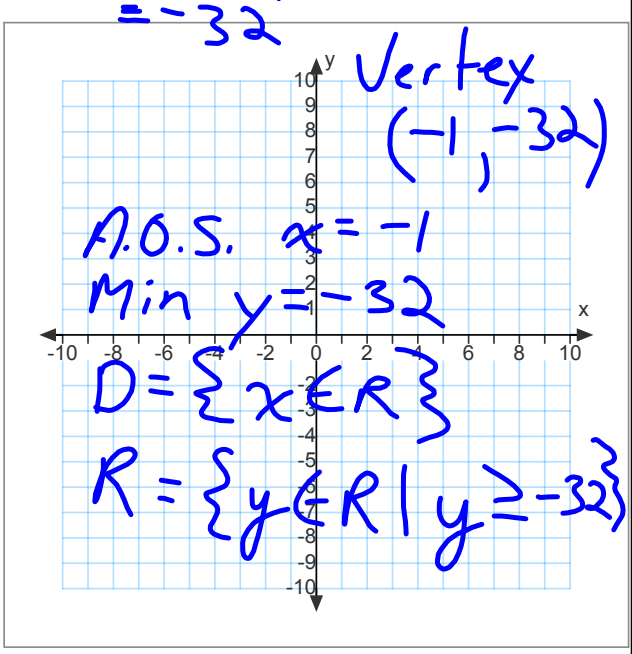
a) $f(x) = -2(x-5)^2 - 4$

opening down
Vertex $(5, -4)$
A.O.S. $= x = 5$
Max $y = -4$
$D = \{x \in R\}$
$R = \{y \in R \mid y \leq -4\}$



b) $f(x) = 2(x-3)(x+5)$

opening up
Vertex x-value
$\frac{3-5}{2} = \frac{-2}{2} = -1$
y-value
$= 2(-1-3)(-1+5)$
$= 2(-4)(4)$
$= -32$



2. a) The height, $h(t)$, in metres, of the tragectory of a football is given by $h(t) = 2 + 28t - 4.9t^2$, where t is the time in flight, in seconds. Determine the maximum height of the football and the time when that height is reached.

$h(t) = -4.9t^2 + 28t + 2$ * Complete the Square

b) How long will it take for the ball to hit the ground?

$0 = -4.9t^2 + 28t + 2$ * Find zeros → Quad. formula

3. a) Determine the inverse of $f(x) = -3(x-4)^2 + 2$

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

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

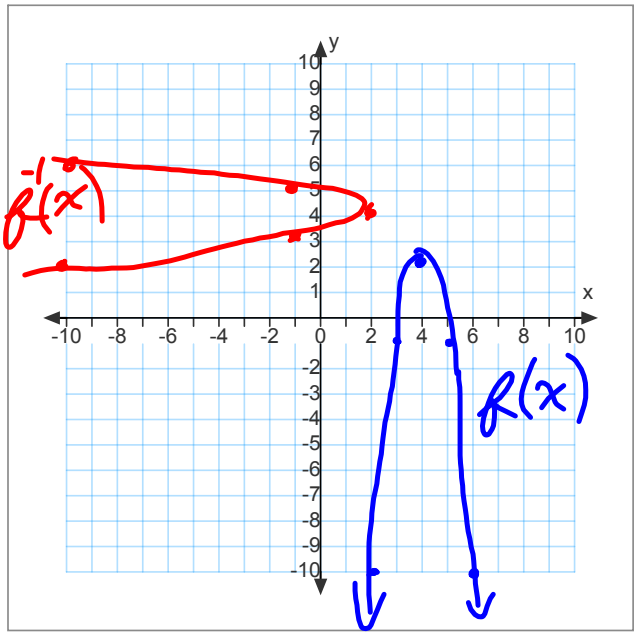
$x - 2 = -3(y-4)^2$

$\frac{x-2}{-3} = (y-4)^2$

$\pm\sqrt{\frac{x-2}{-3}} = y - 4$

$4 \pm \sqrt{\frac{x-2}{-3}} = y$

b) Graph $f(x)$ and $f^{-1}(x)$



c) Is the inverse a function? Explain using words

No → doesn't pass vertical line test.

d) State the domain and range of $f(x)$ and $f^{-1}(x)$

4. Express each radical in simplest radical form.

a) $\sqrt{98}$

$= \sqrt{49 \times 2}$

$= 7\sqrt{2}$

b) $-5\sqrt{50}$

$= -5\sqrt{25 \times 2}$

$= -5 \cdot 5\sqrt{2}$

$= -25\sqrt{2}$

c) $-2\sqrt{12} + 4\sqrt{48}$

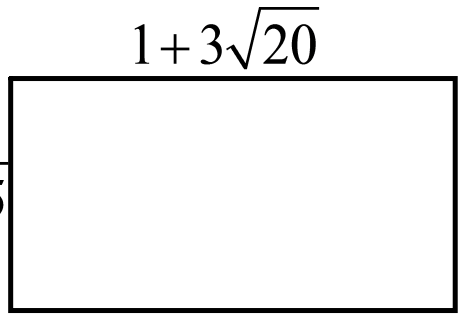
$= -2\sqrt{4 \times 3} + 4\sqrt{16 \times 3}$

$= -2 \cdot 2\sqrt{3} + 4 \cdot 4\sqrt{3}$

$= -4\sqrt{3} + 16\sqrt{3}$

$= 12\sqrt{3}$

5. Determine an expression in lowest terms for the perimeter AND area of the rectangle.



$P = 2(1 + 3\sqrt{20}) + 2(9 - 2\sqrt{45})$

$= 2 + 6\sqrt{20} + 18 - 4\sqrt{45}$

$= 20 + 6\sqrt{4 \times 5} - 4\sqrt{9 \times 5}$

$= 20 + 6 \cdot 2\sqrt{5} - 4 \cdot 3\sqrt{5}$

$= 20 + 12\sqrt{5} - 12\sqrt{5}$

$= 20$

$A = (1 + 3\sqrt{20})(9 - 2\sqrt{45})$

$= 9 - 2\sqrt{45} + 27\sqrt{20} - 6\sqrt{900}$

$= 9 - 2\sqrt{9 \times 5} + 27\sqrt{4 \times 5} - 6(30)$

$= 9 - 2 \cdot 3\sqrt{5} + 27 \cdot 2\sqrt{5} - 180$

$= 9 - 6\sqrt{5} + 54\sqrt{5} - 180$

$= -171 + 48\sqrt{5}$

6. a) The height, $h(t)$, of a projectile, in metres, can be modelled by the equation $h(t) = 14t - 5t^2$, where t is the time in seconds after the projectile is released. Can the projectile ever reach a height of 9 m?

$9 = 14t - 5t^2$

$0 = -5t^2 + 14t + 9$

# of zeros question

$b^2 - 4ac$

$14^2 - 4(-5)(9)$

$= 376 \rightarrow +$

Yes

b) How long will it take for it to hit the ground?

$0 = -5t^2 + 14t$

find zeros

7. Determine the value(s) for k for which the function has no roots.

$$f(x) = 3x^2 - 4x + k$$

$b^2 - 4ac < 0$

$(-4)^2 - 4(3)k < 0$

$16 - 12k < 0$

$-12k < -16$

$k < \frac{-16}{-12}$

$k < \frac{4}{3}$

8. Determine the equation of parabola that has roots $\sqrt{5}$ and $-\sqrt{5}$ and goes through point (-1, 6).

$f(x) = a(x - \sqrt{5})(x + \sqrt{5})$

$6 = a(-1 - \sqrt{5})(-1 + \sqrt{5})$

Solve for "a"

Sub "a" into 1st line

9. Solve $f(x) = 3x^2 - 4x + 2$

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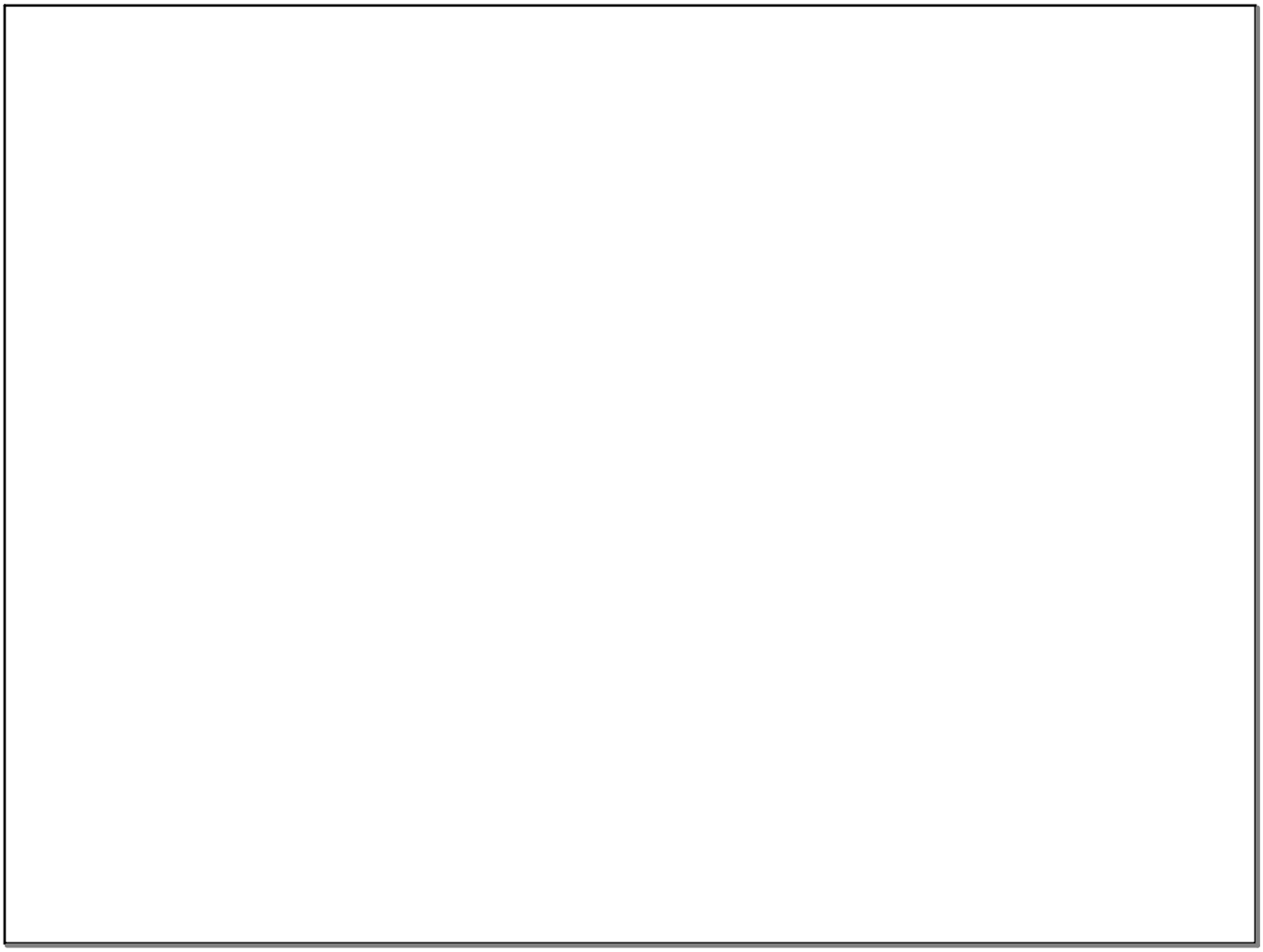

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