The learning targets below are assessed on the *Equations and Inequalities* unit test. The problems below each statement represent the type of questions you are expected to solve to demonstrate mastery of each target.

I can solve linear equations and inequalities.

- $\frac{x}{2} = \frac{3x}{4} + 5$ $x = -20$. Graph to find the x-intercept.
- $1 - \frac{a}{2} > 4$ $(-\infty, -6)$. Graph to see the line is above the x-axis before $x = -6$.

I can solve equations and inequalities involving absolute value.

- $4|2y - 7| + 5 = 7$ $y = 13/4, 15/4$. Graph to find the x-intercepts at $x = 3.25$ and 3.75.
- $5 - |3x - 2| \geq 0$ $[-1, 7/3]$. Graph to see the "V" is above the x-axis between $x = -1$ and $x = 2.333$.
- $\frac{5}{2}|c + 2| + 6 < 3$ No Solution. Graph to see the "V" is always above the x-axis.

I can solve quadratic equations and inequalities.

- $m^2 - 2m - 5 = 0$ $m = 1 \pm \sqrt{6}$. Use the quadratic formula, then simplify: $$m = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-5)}}{2(1)} = \frac{2 \pm \sqrt{24}}{2} = \frac{2 \pm 2\sqrt{6}}{2} = \frac{1 \pm 1\sqrt{6}}{1}.$$
- $z^2 - 4z \geq 0$ $(-\infty, 0] \cup [4, \infty)$. Graph to see the parabola is above the x-axis before $x = 0$ and after $x = 4$.

I can solve radical equations and equations involving rational exponents.

- $\sqrt{r+5} - \sqrt{r-3} = 2$ $r = 4$. Graph to find the x-intercept.
- $(x^2 - x - 4)^{3/4} - 2 = 6$ $x = -4, 5$. Graph to find the x-intercepts.

I can solve polynomial equations and inequalities.

- $x^4 + x^3 = 5x^2 + 3x - 6$ $x = -2, 1, \pm\sqrt{3}$. Graph to find the rational x-intercepts $x = -2$ and $x = 1$, then use synthetic division to depress the equation down to $x^2 - 3 = 0$. Use square roots to find the two irrational zeros.
- $u^3 + 4u^2 \leq u + 4$ $(-\infty, -4] \cup [-1, 1]$. Graph to see the curve is below the x-axis before $x = -4$ and between $x = -1$ and $x = 1$.
- $b^3 - 3b^2 + 4 > 0$ $(-1, 2) \cup (2, \infty)$. Graph to see the curve is above the x-axis between $x = -1$ and $x = 2$ and after $x = 2$.

I can solve rational equations and inequalities.

- $\frac{p-5}{p}=\frac{p}{p+4}-\frac{3}{4}$ p = –20/3, 4. Graph to find the x-intercepts.
- $\frac{k+2}{k-5}\leq 6$ (–∞, 5) ∪ [32/5, ∞). Graph to see the curve is below the x-axis before x = 5 and after x = 6.4. Since there is an asymptote at x = 5, you *cannot* include it in the solution.

I can solve exponential equations.

- $3^{4-t} = 2$ $t=\frac{-\ln 2}{\ln 3}+4$. Take the natural log of both sides:

  $\ln\left(3^{4-t}\right)=\ln(2) \quad \Rightarrow \quad (4-t)\ln 3=\ln 2 \quad \Rightarrow \quad 4-t=\frac{\ln 2}{\ln 3} \quad \Rightarrow \quad -t=\frac{\ln 2}{\ln 3}-4$
- $5 - e^{2w} = 9$ No Solution. Start with $e^{2w} = -4$, when you natural log both sides, you get ln(–4) which is non-real.
- $(1/9)^{3x-2} = 27^{1-x}$ x = 1/3. Rewrite with same base as $(3^{-2})^{3x-2} = (3^3)^{1-x}$, then distribute the powers and drop the bases to get $-6x + 4 = 3 - 3x$.

I can solve logarithmic equations.

- $5 - \ln r = 7$ $r = e^{-2}$. Start with $\ln r = -2$, the exponentiate both sides: $e^{\ln r} = e^{-2}$.
- $\log_5(v^2) = \log_5(v + 12)$ v = –3, 4. Drop the logs to get $v^2 = v + 12$, which can be solved by graphing of factoring. Neither number causes a negative inside a log expression, so both are the solutions.
- $\frac{1}{2}\log(x+3)=1$ x = 97. Start with $\log(x + 3) = 2$, then exponentiate with base 10 to get $10^{\log(x+3)} = 10^2$ to get $x + 3 = 100$.