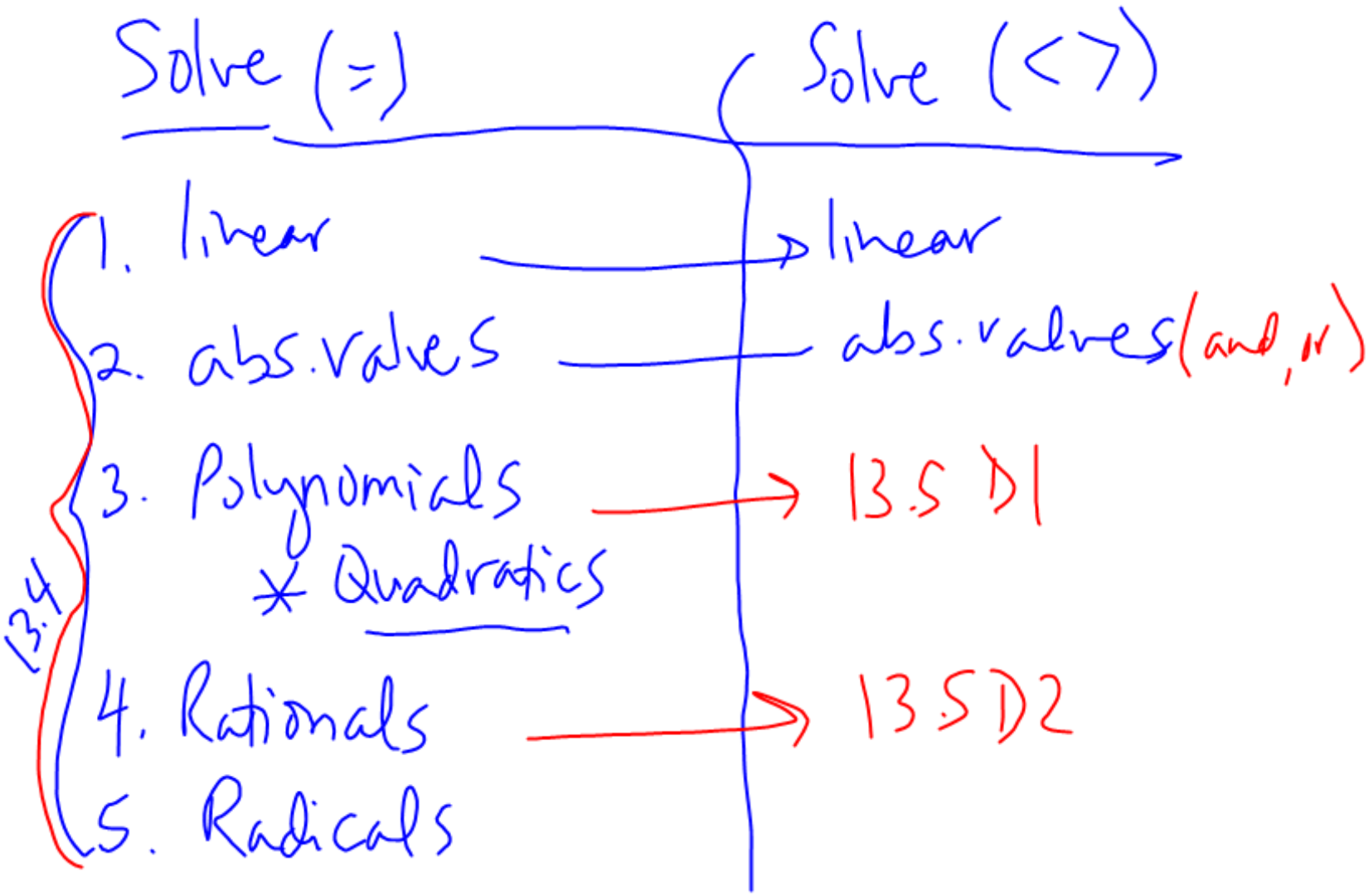
$y = 2x^2 - 4x + 5$ use the vertex Formula to find the Vertex

$2 - 4 + 5$

$x = \frac{-b}{2a} = \frac{+4}{2(2)} = 1$

$V(1, 3)$


Solve (=)
Solve (<)
1. linear
linear
2. abs. values
abs. values (and, or)
3. Polynomials
13.5 D1
* Quadratics
13.4
4. Rationals
13.5 D2
5. Radicals

13.4 u-Substitution → turn into a Quadratic

$$x + \sqrt{x} - 2 = 0$$

let $u = \sqrt{x}$

$u^2 = (\sqrt{x})^2 = x$

$u = -2$: $\sqrt{x} \neq -2$ → $\emptyset$

$u = 1$: $\sqrt{x}^2 = 1^2$, $x = 1$

2

$$u^2 + u - 2 = 0$$

$$(u+2)(u-1) = 0$$

$u = -2$ or $u = 1$

17. $(x^2 + 3x)^2 - 8(x^2 + 3x) - 20 = 0$

let $u = x^2 + 3x$

$u^2 - 8u - 20 = 0$

$(u - 10)(u + 2) = 0$

$u = 10 \quad u = -2$

$u = 10$

$x^2 + 3x = 10$

$x^2 + 3x - 10 = 0$

$(x + 5)(x - 2) = 0$

$x = -5 \quad x = 2$

$u = -2$

$x^2 + 3x = -2$

$x^2 + 3x + 2 = 0$

$(x + 2)(x + 1) = 0$

$x = -2 \quad x = -1$

19. $x^{-2} - x^{-1} - 20 = 0$

u^2 u^1

let $u = x^{-1}$

$u^2 = (x^{-1})^2 = x^{-2}$

$u^2 - u - 20 = 0$

$(u-5)(u+4) = 0$

$u = 5 \quad u = -4$

$u = 5$

$x^{-1} = 5$

$\times 1 \quad \times x$

$1 = 5x$

$\frac{1}{5} \quad \frac{5x}{5}$

$x = \frac{1}{5}$

$u = -4$

$x^{-1} = -4$

$\frac{1}{x} = \frac{-4}{1}$

$x = -\frac{1}{4}$

25. $x^{\frac{2}{3}} - x^{\frac{1}{3}} - 6 = 0$

$\sqrt[3]{x^2} - \sqrt[3]{x} - 6 = 0$

let $u = x^{\frac{1}{3}}$

$u^2 = \left(x^{\frac{1}{3}}\right)^{\frac{2}{1}} = x^{\frac{2}{3}}$

$u^2 - u - 6 = 0$

$(u-3)(u+2) = 0$

$u = 3 \quad u = -2$

$u = 3$ $\quad u = -2$

$x^{\frac{1}{3}} = 3$ $\quad x^{\frac{1}{3}} = -2$

$\sqrt[3]{x^3} = 3^3$ $\quad \sqrt[3]{x^3} = (-2)^3$

$x = 27$ $\quad x = -8$

30. $2x^{\frac{1}{2}} - 5x^{\frac{1}{4}} = 3$

let $u = x^{\frac{1}{4}}$

$u^2 = (x^{\frac{1}{4}})^{\frac{2}{1}} = x^{\frac{2}{4}} = x^{\frac{1}{2}}$

$2u^2 - 5u - 3 = 0$

$(2u+1)(u-3) = 0$

$2u + 1 = 0$

$\frac{2u}{2} = \frac{-1}{2}$

$u = -\frac{1}{2}$ | $u = 3$

$u = -\frac{1}{2}$

$x^{\frac{1}{4}} = -\frac{1}{2}$

$\sqrt[4]{x} \neq -\frac{1}{2}$

$u = 3$

$x^{\frac{1}{4}} = 3$

$\sqrt[4]{x}^4 = 3^4$

$x = 81$

24. $x^{-2} - 6x^{-1} = -4$

Solve using sub.

let $u = x^{-1}$

$u^2 - 6u + 4 = 0$

$u = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(4)}}{2(1)}$

$u = \dfrac{6 \pm \sqrt{36-16}}{2} = \dfrac{6 \pm \sqrt{20}}{2}$ → 4.5

$u = \dfrac{6 \pm 2\sqrt{5}}{2} = \dfrac{2(3 \pm \sqrt{5})}{2}$

$u = 3 \pm \sqrt{5}$

$u = 3+\sqrt{5}$

$x^{-1} = 3+\sqrt{5}$

$\dfrac{1}{x} = \dfrac{3+\sqrt{5}}{1}$

$x = \dfrac{1}{3+\sqrt{5}} \cdot \dfrac{3-\sqrt{5}}{3-\sqrt{5}}$

$x = \dfrac{3-\sqrt{5}}{9-5}$

$x = \dfrac{3-\sqrt{5}}{4}$

$u = 3-\sqrt{5}$

$x^{-1} = 3-\sqrt{5}$

$x = \dfrac{3+\sqrt{5}}{4}$

6. $x^4 + 4x^2 = 5$

$x^4 + 4x^2 - 5 = 0$

let $u = x^2$

$u^2 + 4u - 5 = 0$

$(u+5)(u-1) = 0$

$u = -5$ or $u = 1$

$u = -5$ $\quad u = 1$

$\sqrt{x^2} = \pm\sqrt{-5}$ $\quad \sqrt{x^2} = \pm\sqrt{1}$

$x = \pm\sqrt{5}i$ $\quad x = \pm 1$

$x^2 = 1$

$x^2 - 1 = 0$