

① $6x^3 + 9x =$

$3x(2x^2 + 3) =$ ✓ factor GCF

② $3x^2y^6 + 15x^2y^5 =$

$3x^2y^5(y + 5) =$ ✓ factor GCF

③ $40r^2 + 25ry - 8xr - 5xy =$

factor by grouping

$(40r^2 + 25ry) + (-8xr - 5xy) =$

$5r(8r + 5y) + x(-8r - 5y) =$

$5r(8r + 5y) - x(8r + 5y) =$

$(8r + 5y)(5r - x) =$ ✓

④ $x^2 + 5x + xy + 5y =$

factor by grouping

$(x^2 + 5x) + (xy + 5y) =$

$x(x + 5) + y(x + 5) =$

$(x + 5)(x + y) =$ ✓

⑤ $100 - y^2 =$

factor

$a^2 - b^2 = (a + b)(a - b)$

$(10)^2 - (y)^2 =$

$(10 + y)(10 - y) =$ ✓

⑥ $49x^2 + 4 =$

factor

$a^2 - b^2 = (a + b)(a - b)$

$(7x)^2 + (2)^2 =$ ✓

must be negative

prime

$$\textcircled{7} \quad 8x^3 + 18x^2 + 9x = \text{factor}$$

$$x(8x^2 + 18x + 9) =$$

$$x(2x + 3)(4x + 3) = \checkmark$$

$$\textcircled{8} \quad 24x^3 - 104x^2 - 80x = \text{factor}$$

$$8x(3x^2 - 13x - 10) =$$

$$8x(3x + 2)(x - 5) = \checkmark$$

$$\textcircled{9} \quad z^2 - 2z + 1 = \text{factor}$$

$$(z - 1)(z - 1) = \checkmark$$

$$\textcircled{10} \quad 25x^2 + 30x + 9 = \text{factor}$$

$$(5x + 3)(5x + 3) = \checkmark$$

$$\textcircled{11} \quad y^3 + 49y^2 + 50y = \text{factor}$$

$$y(y^2 + 49y + 50) =$$

$$\textcircled{12} \quad 3(x - 2) - a(x - 2) = \text{factor}$$

$$(x - 2)(3 - a) = \checkmark$$



$$(13) \frac{3x-15}{x^2-25} =$$

Simplify

$$\frac{3(x-5)}{(x)^2-(5)^2} =$$

$$\frac{3(x-5)}{(x+5)(x-5)} =$$

$$\frac{3}{x+5} = \checkmark$$



$$(14) \frac{5x-2}{15x^2+4x-4} =$$

$$\begin{matrix} 15.1 \\ 3.5 \end{matrix} \quad \begin{matrix} 4.1 \\ 2.2 \end{matrix}$$

Simplify

$$\frac{(5x-2)}{(5x-2)(3x+2)} =$$

$$\frac{1}{3x+2} = \checkmark$$

$$(15) \frac{21m^5p^2}{(m+p)} \cdot \frac{(m-p)}{3m^8p^1} =$$

Simplify

$$\frac{7p^1}{(m+p)} \cdot \frac{(m-p)}{m^3} =$$

$$\frac{7p(m-p)}{m^3(m+p)} =$$

OR

$$\frac{7pm-7p^2}{m^3(m+p)}$$

$$(16) \frac{d^3 + 125}{d-7} \cdot \frac{d^2 - 7d}{d^2 - 5d + 25} =$$

Simplifying

$$\frac{(d)^3 + (5)^3}{d-7} \cdot \frac{d^2 - 7d}{d^2 - 5d + 25} =$$

$$A^3 + B^3 = (A+B)(A^2 - AB + B^2)$$

$$\frac{(d+5)(\cancel{d^2 - 5d + 25})}{\cancel{(d-7)}} \cdot \frac{d(\cancel{d-7})}{(\cancel{d^2 - 5d + 25})} =$$



$$d(d+5) =$$

$$\text{OR } d^2 + 5d =$$

Simplifying

$$(17) \frac{2k^2 + 17k + 21}{9k^2 - 24k + 16} \div \frac{6k^2 + 17k + 12}{9k^2 - 16} =$$

$$\frac{2k^2 + 17k + 21}{9k^2 - 24k + 16} \cdot \frac{9k^2 - 16}{6k^2 + 17k + 12} =$$

$$\frac{(2k+3)(k+7)}{(3k-4)(3k-4)} \cdot \frac{(3k)^2 - (4)^2}{(2k+3)(3k+4)} =$$

$$\frac{\cancel{(2k+3)}(k+7)}{\cancel{(3k-4)}(\cancel{3k-4})} \cdot \frac{\cancel{(3k+4)}(\cancel{3k-4})}{\cancel{(2k+3)}(\cancel{3k+4})} =$$

$$\frac{k+7}{3k-4} =$$

$$\textcircled{18} \frac{x^2 + 7x + 10}{x^2 + 10x + 25} \div \frac{10 + 3x - x^2}{2x^2 - 50} =$$

Simplify



$$\frac{x^2 + 7x + 10}{x^2 + 10x + 25} \cdot \frac{2x^2 - 50}{10 + 3x - x^2} =$$

$$\frac{(x+2)(x+5)}{(x+5)(x+5)} \cdot \frac{2(x^2 - 25)}{-x^2 + 3x + 10} =$$

$$\frac{(x+2)(x+5)}{(x+5)(x+5)} \cdot \frac{2(x+5)(x-5)}{-1(x^2 - 3x - 10)} =$$

$$\frac{\cancel{(x+2)}\cancel{(x+5)}}{\cancel{(x+5)}\cancel{(x+5)}} \cdot \frac{2\cancel{(x+5)}(x-5)}{-1\cancel{(x+2)}\cancel{(x-5)}} =$$

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

$$\textcircled{-2} = \checkmark$$

$$\textcircled{19} \sqrt{490} =$$

Simplify

$$\sqrt{49 \times 10} =$$

$$\sqrt{49} \sqrt{10} =$$

$$\textcircled{7\sqrt{10}} = \checkmark$$

$$\begin{array}{r} 2 \overline{) 490} \\ 5 \overline{) 245} \\ 7 \overline{) 49} \\ 7 \overline{) 7} \\ 1 \end{array}$$

20) $\sqrt{500} =$
 $\sqrt{100 \cdot 5} =$
 $\sqrt{100} \sqrt{5} =$
 $10\sqrt{5} =$ ✓

Simplify

$$\begin{array}{r} 2 \overline{) 500} \\ 2 \overline{) 250} \\ 5 \overline{) 125} \\ 5 \overline{) 25} \\ 5 \overline{) 5} \\ \hline \end{array}$$



21) $-\sqrt{\frac{49m^2}{n^2}} =$ Simplify

$$\frac{-\sqrt{49m^2}}{\sqrt{n^2}} =$$

$$\frac{-7|m|}{|n|} =$$
 ✓

OR

$$-7 \left| \frac{m}{n} \right| =$$

22) $\sqrt{(x-1)^2} =$ Simplify

$$|x-1| =$$

23) $\sqrt{5y} \cdot \sqrt{35y} =$

$$\sqrt{5y \cdot 35y} =$$

$$\sqrt{175y^2} =$$

$$\sqrt{25 \cdot 7 \cdot y^2} =$$

$$\sqrt{25} \sqrt{y^2} \sqrt{7} =$$

$$5y\sqrt{7} =$$
 ✓

Simplify

$$\begin{array}{r} 5 \\ 35 \\ \times 5 \\ \hline 175 \end{array}$$

$$\begin{array}{r} 5 \overline{) 175} \\ 5 \overline{) 35} \\ 7 \overline{) 7} \\ \hline 1 \end{array}$$

$$(24) \sqrt{3x^3} \sqrt{6x^2} =$$

$$\sqrt{3x^3 6x^2} =$$

$$\sqrt{18x^5} =$$

$$\sqrt{9 \cdot 2x^4 x^1} =$$

$$3x^2 \sqrt{2x} =$$

$$\begin{array}{r} 2 \overline{) 18} \\ 3 \overline{) 9} \\ 3 \overline{) 3} \\ 1 \end{array}$$

Simplify



$$(25) \frac{\sqrt{96}}{\sqrt{6}} =$$

Simplify

$$\sqrt{\frac{96}{6}} =$$

$$\sqrt{16} =$$

$$4 =$$

$$(26) \frac{3\sqrt{200}}{\sqrt{2}} =$$

Simplify

$$3\sqrt{\frac{200}{2}} =$$

$$3\sqrt{100} =$$

$$3(10) =$$

$$30 =$$

(27) $\sqrt{-7x-10} = x+4$

Simplify

$$(\sqrt{-7x-10})^2 = (x+4)^2$$

$$-7x-10 = (x+4)(x+4)$$

$$-7x-10 = x^2 + 4x + 4x + 16$$

$$-7x-10 = x^2 + 8x + 16$$

$$0 = x^2 + 8x + 16 + 7x + 10$$

$$0 = x^2 + 15x + 26$$

$$0 = (x+2)(x+13)$$

$$x+2=0 \quad \text{OR} \quad x+13=0$$

$$x+2-2=0-2 \quad \text{OR} \quad x+13-13=0-13$$

$$x = -2$$

$$\text{OR } x = -13$$

ck Good

~~BAD~~

$$\sqrt{-7x-10} = x+4$$

$$\sqrt{-7(-2)-10} = (-2)+4$$

$$\sqrt{14-10} = -2+4$$

$$\sqrt{4} = 2$$

$$2 = 2 \checkmark$$

Good

$$\sqrt{-7x-10} = x+4$$

$$\sqrt{-7(-13)-10} = (-13)+4$$

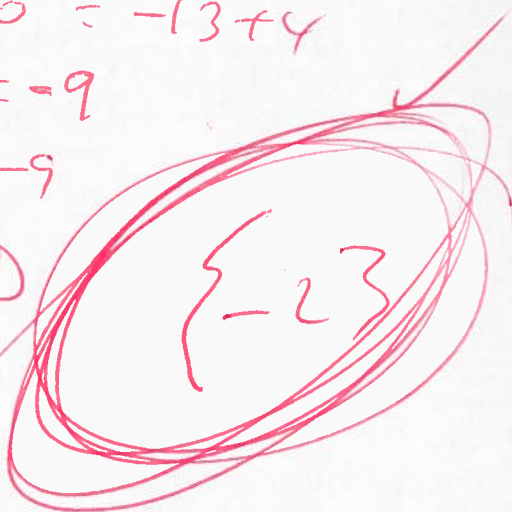
$$\sqrt{91-10} = -13+4$$

$$\sqrt{81} = -9$$

$$9 \neq -9$$

~~BAD~~

$\{-2, -13\}$



(28) $\sqrt{x} + 1 = \sqrt{x+5}$
 $(\sqrt{x} + 1)^2 = (\sqrt{x+5})^2$

Simplify

$$(\sqrt{x} + 1)(\sqrt{x} + 1) = x + 5$$

$$(\sqrt{x})^2 + \sqrt{x} + \sqrt{x} + 1 = x + 5$$

$$x + 2\sqrt{x} + 1 = x + 5$$

$$2\sqrt{x} = x + 5 - x - 1$$

$$2\sqrt{x} = 4$$

$$\frac{2\sqrt{x}}{2} = \frac{4}{2}$$

$$\sqrt{x} = 2$$

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

$$x = 4$$

check

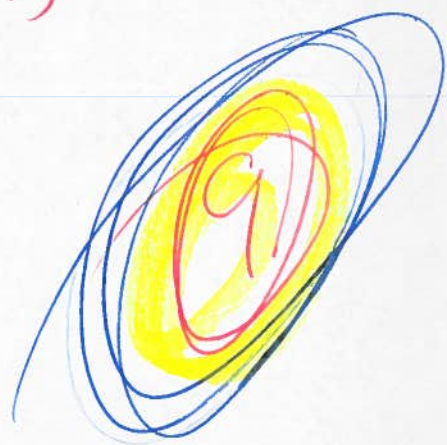
$$\sqrt{x} + 1 = \sqrt{x+5}$$

$$\sqrt{4} + 1 = \sqrt{4+5}$$

$$2 + 1 = \sqrt{9}$$

$$3 = 3$$

Good



{4}

$$(29) \sqrt[3]{135} =$$

$$\sqrt[3]{27 \cdot 5} =$$

$$\begin{array}{r} 3 \overline{) 135} \\ 3 \overline{) 45} \\ 3 \overline{) 15} \\ 5 \overline{) 5} \\ 1 \end{array}$$

Simplify

$$3 \sqrt[3]{5} = \checkmark$$

$$(30) \sqrt[5]{32 x^4 y^{28}} =$$

$$\sqrt[5]{2^5 x^4 y^{25} y^3} =$$

$$\begin{array}{r} 2 \overline{) 32} \\ 2 \overline{) 16} \\ 2 \overline{) 8} \\ 2 \overline{) 4} \\ 2 \overline{) 2} \\ 1 \end{array}$$

Simplify

$$2 y^5 \sqrt[5]{x^4 y^3} = \checkmark$$

$$(31) (27)^{2/3} =$$

Simplify

$$(3)^{2/3} =$$

$$(3)^{2/3} =$$

$$3^{2/3} =$$

$$3^2 =$$

$$(3)(3) = \checkmark$$

$$9 =$$

$$(32) \left(\frac{16}{9}\right)^{\frac{1}{2}} =$$

$$\left(\frac{4^2}{3^2}\right)^{\frac{1}{2}} =$$

Simplify

$$\frac{4^{\frac{2}{2}}}{3^{\frac{2}{2}}} =$$

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

$$\frac{4}{3} = \checkmark$$



$$(33) h(x) = 3x^2 - 7x - 4 \quad \text{Find } h(-5)$$

$$h(-5) = 3(-5)^2 - 7(-5) - 4$$

$$h(-5) = 3(-5)(-5) - 7(-5) - 4$$

$$h(-5) = 3(25) - 7(-5) - 4$$

$$h(-5) = 75 + 35 - 4$$

$$h(-5) = 110 - 4$$

$$h(-5) = 106$$

$$(-5, 106)$$

(34) $f(t) = -3t^3 + 6t^2 - t - 41$ find $f(-2)$

$$f(-2) = -3(-2)^3 + 6(-2)^2 - (-2) - 41$$

$$f(-2) = -3(-2)(-2)(-2) + 6(-2)(-2) - (-2) - 41$$

$$f(-2) = -3(-8) + 6(4) - (-2) - 41$$

$$f(-2) = 24 + 24 + 2 - 41$$

$$f(-2) = 48 + 2 - 41$$

$$f(-2) = 50 - 41$$

$$f(-2) = 9$$

$$(-2, 9)$$



(35) $g(x) = 2x^2 - 5x - 3$ find $g(x-1)$

$$g(x-1) = 2(x-1)^2 - 5(x-1) - 3$$

$$g(x-1) = 2(x-1)(x-1) - 5(x-1) - 3$$

$$g(x-1) = 2(x^2 - x - x + 1) - 5(x-1) - 3$$

$$g(x-1) = 2(x^2 - 2x + 1) - 5(x-1) - 3$$

$$g(x-1) = 2x^2 - 4x + 2 - 5x + 5 - 3$$

$$g(x-1) = 2x^2 - 9x + 4$$

$$(x-1, 2x^2 - 9x + 4)$$

(36) $f(x) = 8x + 8$ find $\frac{f(a+h) - f(a)}{h}$

$$\frac{(8(a+h) + 8) - (8(a) + 8)}{h} =$$

$$\frac{8a + 8h + 8 - 8a - 8}{h} =$$

$$\frac{8h}{h} =$$

$$8$$

37. $f(x) = \frac{4}{x-2}$ and $g(x) = \frac{3x}{x^2-4}$

$$(f+g)(x) =$$

$$f(x) + g(x) =$$

$$\frac{4}{x-2} + \frac{3x}{x^2-4} =$$

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

$$\left(\frac{4}{x-2}\right)\left(\frac{x+2}{x+2}\right) + \frac{3x}{(x+2)(x-2)} =$$

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

$$\frac{4x + 8 + 3x}{(x+2)(x-2)} =$$

$$\frac{7x + 8}{(x+2)(x-2)} =$$

$$LCD = (x+2)(x-2)$$



38) $f(x) = 2x^2 - 3$ and $g(x) = 7x - 4$

$$(f-g)(x) =$$

$$f(x) - g(x) =$$

$$(2x^2 - 3) - (7x - 4) =$$

$$2x^2 - 3 - 7x + 4 =$$

$$2x^2 - 7x + 1 =$$

✓



39) $f(x) = 5x^2 - 2$ and $g(x) = 4x + 1$

$$(f \cdot g)(x) =$$

$$f(x) \cdot g(x) =$$

$$(5x^2 - 2)(4x + 1) =$$

✓

$$20x^3 + 5x^2 - 8x - 2 =$$

40) $f(x) = 5x + 1$ and $g(x) = 2x - 5$

$$\left(\frac{f}{g}\right)(x) =$$

$$\frac{f(x)}{g(x)} =$$

$$\frac{5x+1}{2x-5} =$$

✓

$$\begin{aligned} (41) \quad & (-9 + 14i) - (5 - 2i) = \\ & -9 + 14i - 5 + 2i = \\ & \underline{-14 + 16i} \end{aligned}$$

$$\begin{aligned} (42) \quad & (-6 - 7i) + (12 + 4i) = \\ & -6 - 7i + 12 + 4i = \\ & \underline{6 - 3i} \end{aligned}$$

$$\begin{aligned} (43) \quad & (7 - 4i)(7 + 4i) = \\ & 49 + 28i - 28i - 16i^2 = \\ & 49 - 16i^2 = \\ & 49 - 16(-1) = \\ & 49 + 16 = \end{aligned}$$

$$\underline{(65)} \quad \text{OR} \quad 65 + 0i$$



$$(44) \quad \left(\frac{1 - 2i}{7 + i} \right) =$$

$$\left(\frac{1 - 2i}{7 + i} \right) \left(\frac{7 - i}{7 - i} \right) =$$

$$\frac{7 - 1i - 14i + 2i^2}{49 - 7i + 7i - i^2} =$$

$$\frac{7 - 15i + 2i^2}{49 - i^2} =$$

$$\frac{7 - 15i + 2(-1)}{49 - (-1)} =$$

$$\frac{7 - 15i - 2}{49 + 1} =$$

$$\frac{5 - 15i}{50} =$$

$$\frac{5}{50} - \frac{15}{50}i =$$

$$\underline{\frac{1}{10} - \frac{3}{10}i}$$

$$(45) \quad X(6X-1)=0$$

$$\text{Set } X=0 \quad \text{OR} \quad 6X-1=0$$

$$6X-1+1=0+1$$

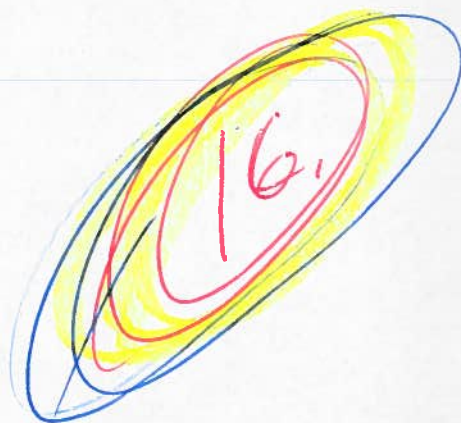
$$6X=1$$

$$\frac{6X}{6} = \frac{1}{6}$$

$$X = \frac{1}{6}$$

✓

$$\left\{0, \frac{1}{6}\right\}$$



$$(46) \quad 7X^2 + 19X - 6 = 0$$

$$(7X-2)(X+3) = 0$$

$$7X-2=0 \quad \text{OR} \quad X+3=0$$

$$7X-2+2=0+2 \quad \text{OR} \quad X+3-3=0-3$$

$$7X=2$$

$$\frac{7X}{7} = \frac{2}{7}$$

$$X = \frac{2}{7}$$

$$\text{OR } X = -3$$

$$\left\{-3, \frac{2}{7}\right\}$$

$$(47) \quad X^2 = \frac{81}{49}$$

$$\sqrt{X^2} = \pm \sqrt{\frac{81}{49}}$$

$$X = \pm \frac{9}{7}$$

$$X = -\frac{9}{7} \quad \text{OR} \quad X = \frac{9}{7}$$

$$\left\{-\frac{9}{7}, \frac{9}{7}\right\}$$

$$(48) \quad (3x+9)^2 = 64$$

$$\sqrt{(3x+9)^2} = \pm \sqrt{64}$$

$$3x+9 = \pm 8$$

$$3x+9 = -8 \quad \text{OR} \quad 3x+9 = 8$$

$$3x + \cancel{9} - \cancel{9} = -8 - 9 \quad \text{OR} \quad 3x + \cancel{9} - \cancel{9} = 8 - 9$$

$$3x = -17 \quad \text{OR} \quad 3x = -1$$

$$\frac{3x}{3} = \frac{-17}{3} \quad \text{OR} \quad \frac{3x}{3} = \frac{-1}{3}$$

$$x = \frac{-17}{3}$$

$$\text{OR} \quad x = -\frac{1}{3}$$

$$\left\{ \frac{-17}{3}, -\frac{1}{3} \right\}$$



(49) Complete the square

$$3x^2 + 15x = -18$$

$$\frac{3x^2}{3} + \frac{15x}{3} = \frac{-18}{3}$$

$$x^2 + 5x = -6$$

$$x^2 + 5x + \left(\frac{1}{2}(5)\right)^2 = -6 + \left(\frac{1}{2}(5)\right)^2$$

$$x^2 + 5x + \left(\frac{5}{2}\right)^2 = -6 + \left(\frac{5}{2}\right)^2$$

$$x^2 + 5x + \left(\frac{5}{2}\right)\left(\frac{5}{2}\right) = -6 + \left(\frac{5}{2}\right)\left(\frac{5}{2}\right)$$

$$x^2 + 5x + \frac{25}{4} = -6 + \frac{25}{4}$$

$$\left(x + \frac{5}{2}\right)\left(x + \frac{5}{2}\right) = -\frac{6}{1} + \frac{25}{4}$$

$$\left(x + \frac{5}{2}\right)^2 = -\frac{6}{1}\left(\frac{4}{4}\right) + \frac{25}{4}$$

$$\left(x + \frac{5}{2}\right)^2 = -\frac{24}{4} + \frac{25}{4}$$

$$\left(x + \frac{5}{2}\right)^2 = \frac{1}{4}$$

$$\sqrt{\left(x + \frac{5}{2}\right)^2} = \pm \sqrt{\frac{1}{4}}$$

$$x + \frac{5}{2} = \pm \frac{1}{2}$$

$$x + \frac{5}{2} = -\frac{1}{2} \quad \text{OR} \quad x + \frac{5}{2} = \frac{1}{2}$$

$$x + \frac{5}{2} - \frac{5}{2} = -\frac{1}{2} - \frac{5}{2} \quad \text{OR} \quad x + \frac{5}{2} - \frac{5}{2} = \frac{1}{2} - \frac{5}{2}$$

$$x = -\frac{6}{2}$$

$$x = -3$$

$$\text{OR} \quad x = -\frac{4}{2}$$

$$x = -2$$

$$\{-3, -2\}$$

(50) $x^2 + 6x = 31$ Complete the square

$$x^2 + 6x + \left(\frac{1}{2}(6)\right)^2 = 31 + \left(\frac{1}{2}(6)\right)^2$$

$$x^2 + 6x + (3)^2 = 31 + (3)^2$$

$$x^2 + 6x + 9 = 31 + 9$$

$$x^2 + 6x + 9 = 40$$

$$(x+3)(x+3) = 40$$

$$(x+3)^2 = 40$$

$$\sqrt{(x+3)^2} = \pm\sqrt{40}$$

$$x+3 = \pm\sqrt{40}$$

$$x+3 = \pm\sqrt{4 \cdot 10}$$

$$x+3 = \pm 2\sqrt{10}$$

$$x + \cancel{3} - \cancel{3} = \pm 2\sqrt{10} - 3$$

$$x = -3 \pm 2\sqrt{10}$$

$$x = -3 - 2\sqrt{10}$$

$$\text{OR } x = -3 + 2\sqrt{10}$$



$$\begin{array}{r} 2 \overline{) 40} \\ 2 \overline{) 20} \\ 2 \overline{) 10} \\ 5 \overline{) 5} \\ 1 \end{array}$$



$$\{-3 - 2\sqrt{10}, -3 + 2\sqrt{10}\}$$

(51) Use Quadratic formula

$$5x^2 + 8x = 4$$

$$5x^2 + 8x - 4 = 0$$

$$a = 5, b = 8, c = -4$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(8) \pm \sqrt{(8)^2 - 4(5)(-4)}}{2(5)}$$

$$x = \frac{-8 \pm \sqrt{64 + 80}}{10}$$

$$x = \frac{-8 \pm \sqrt{144}}{10}$$

$$x = \frac{-8 \pm 12}{10}$$

$$x = \frac{-8 - 12}{10} \quad \text{OR} \quad x = \frac{-8 + 12}{10}$$

$$x = \frac{-20}{10} \quad \text{OR} \quad x = \frac{4}{10}$$

$$x = -2$$

$$\text{OR} \quad x = \frac{2}{5}$$

$$\left\{-2, \frac{2}{5}\right\}$$



$$(52) 17x^2 - 2x = 0$$
$$a=17, b=-2, c=0$$

Use the Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(17)(0)}}{2(17)}$$

$$x = \frac{2 \pm \sqrt{4 - 0}}{34}$$

$$x = \frac{2 \pm \sqrt{4}}{34}$$

$$x = \frac{2 \pm 2}{34}$$

$$x = \frac{2-2}{34} \quad \text{OR} \quad x = \frac{2+2}{34}$$

$$x = \frac{0}{34} \quad \text{OR} \quad x = \frac{4}{34}$$

$$x = 0 \quad \text{OR} \quad x = \frac{2}{17}$$

$$\left\{ 0, \frac{2}{17} \right\}$$

