

Homework Qs

Note Title

11/9/2015

$$\begin{aligned} 5.5 \#19 & \quad 2x^3 + 432y^3 \\ &= 2(x^3 + 216y^3) \\ &= 2(x^3 + (6y)^3) \\ &= 2(x + 6y)(x^2 - 6xy + (6y)^2) \\ &= \boxed{2(x + 6y)(x^2 - 6xy + 36y^2)} \end{aligned}$$

$$\begin{aligned} 5.4 \#29 & \quad 3x^3y - 75xy^3 \\ &= 3xy(x^2 - 25y^2) \\ &= \boxed{3xy(x + 5y)(x - 5y)} \end{aligned}$$

$$\begin{aligned} 5.5 \#35 & \quad \frac{1}{8}x^3 - \frac{1}{27}y^3 \\ &= \left(\frac{1}{2}x\right)^3 - \left(\frac{1}{3}y\right)^3 \\ &= \left(\frac{1}{2}x - \frac{1}{3}y\right)\left(\left(\frac{1}{2}x\right)^2 + \left(\frac{1}{2}x\right)\left(\frac{1}{3}y\right) + \left(\frac{1}{3}y\right)^2\right) \\ &= \boxed{\left(\frac{1}{2}x - \frac{1}{3}y\right)\left(\frac{1}{4}x^2 + \frac{1}{6}xy + \frac{1}{9}y^2\right)} \end{aligned}$$

$$\begin{aligned} 5.6 \#69 & \quad (x+2)^4 + 5(x+2)^2 \\ &= (x+2)^2((x+2)^2 + 5) \\ &= (x+2)^2(x^2 + 4x + 4 + 5) \\ &= \boxed{(x+2)^2(x^2 + 4x + 9)} \end{aligned}$$

This problem is like
 $y^4 + 5y^2$ with $y = x+2$
 $y^2(y^2 + 5)$
 $5(x+2)^2 = (x+2)(x+2)$
 $= x^2 + 2x + 2x + 4$
 $= x^2 + 4x + 4$

Ex: $7(x+2)^5 + 8(x+2)^3$

$$= (x+2)^3 (7(x+2)^2 + 8)$$

$$= (x+2)^3 (7(x^2 + 4x + 4) + 8)$$

$$= (x+2)^3 (7x^2 + 28x + 28 + 8)$$

$$= (x+2)^3 (7x^2 + 28x + 36)$$

Scratchwork on previous page

$$\begin{array}{r} 7x^2 \\ \wedge \\ 7x \cdot x \end{array}$$

$$\begin{array}{r} 36 \\ \wedge \\ 1 \cdot 36 \\ 2 \cdot 18 \\ 3 \cdot 12 \\ 4 \cdot 9 \\ 6 \cdot 6 \end{array}$$

5.6 #71) $(2x+1)^3 - (2x+1)$

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

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

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

$$= (2x+1)(4x)(x+1)$$

$$= \boxed{4x(2x+1)(x+1)}$$

similar to $y^3 - y$
 $= y(y^2 - 1)$

$$\begin{aligned} (2x+1)^2 &= (2x+1)(2x+1) \\ &= 4x^2 + 2x + 2x + 1 \\ &= 4x^2 + 4x + 1 \end{aligned}$$

5.7: Solving Quadratic Eqs (cont'd)

Ex: $-5x^3 + 80x = 0$

$$-5x(x^2 - 16) = 0$$

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

$$-5x = 0 \mid x+4 = 0 \mid x-4 = 0$$

$$\frac{-5x}{-5} = \frac{0}{-5} \mid x = -4 \mid x = 4$$

$$x = 0$$

Solution Set:

$$\boxed{\{0, 4, -4\}}$$

OR

$$\boxed{\{0, \pm 4\}}$$

± 4 : "plus or minus 4"

$$\begin{array}{r} 3 \\ 16 \\ \hline 80 \end{array}$$

Ex:

$$12x^2 - 10 = 14x$$

$$12x^2 - 14x - 10 = 0$$

$$2(6x^2 - 7x - 5) = 0$$

$$2(2x + 1)(3x - 5) = 0$$

$2=0$
never true
This factor
does not
contribute a
solution

or $2x + 1 = 0$

$$2x = -1$$

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

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

or

$$3x - 5 = 0$$

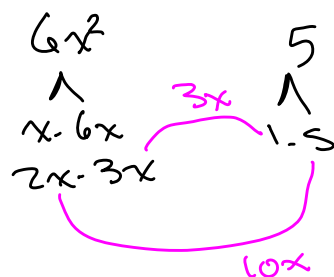
$$3x = 5$$

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

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

Solution Set:

$$\left\{-\frac{1}{2}, \frac{5}{3}\right\}$$



Solve.

Ex:

~~$$9x + 6x^2 = x^3$$~~

~~$$-x^3 + 6x^2 + 9x = 0$$~~

~~$$-x(x^2 + 6x + 9) = 0$$~~

$$-9x + 6x^2 = x^3$$

$$-x^3 + 6x^2 - 9x = 0$$

$$-x(x^2 - 6x + 9) = 0$$

$$-x(x-3)(x-3) = 0$$

$$\begin{array}{l|l|l} -x=0 & x-3=0 & x-3=0 \\ \hline \frac{-x}{-1} = \frac{0}{-1} & x=3 & x=3 \end{array}$$

$$x=0$$

Sol'n Set:

$$\{0, 3\}$$

Ex:

Solve.

$$x^2 = 7x$$

$$x^2 - 7x = 0$$

$$x(x-7) = 0$$

$$\begin{array}{l|l} x=0 & x-7=0 \\ & x=7 \end{array}$$

Sol'n Set:

$$\{0, 7\}$$

5.7 # 47) $6x^2 = -5x + 4$

4

$$6x^2 + 5x - 4 = 0$$

$$(2x - 1)(3x + 4) = 0$$

$$\begin{array}{l|l} 2x - 1 = 0 & 3x + 4 = 0 \\ 2x = 1 & 3x = -4 \\ x = \frac{1}{2} & x = -\frac{4}{3} \end{array}$$

$$\begin{array}{cc} 6x^2 & 4 \\ \wedge & \wedge \\ 6x \cdot x & 1 \cdot 4 \\ 2x \cdot 3x & 2 \cdot 2 \end{array}$$

$3x$ (above the middle line)
 $8x$ (below the middle line)

$$\left\{ \frac{1}{2}, -\frac{4}{3} \right\}$$

5.8 : Applications of Quadratic Equations

Ex: The length of a rectangle is 6" more than four times its width. The area of the rectangle is 70 square inches. Find the length and width.

length: $4x + 6$
width: x

length $\xrightarrow[\text{to}]{\text{compare}}$ width
 x

Area of rectangle = (length)(width)

$$70 = (4x + 6)(x)$$

$$x(4x + 6) = 70$$

$$4x^2 + 6x = 70$$

$$4x^2 + 6x - 70 = 0$$

$$2(2x^2 + 3x - 35) = 0$$

$$2(2x - 7)(x + 5) = 0$$

$$\begin{array}{l|l|l} 2=0 & 2x-7=0 & x+5=0 \\ \text{never true} & 2x=7 & x=-5 \\ & x=\frac{7}{2} & \end{array}$$

$$\begin{array}{cc} 2x^2 & 35 \\ \wedge & \wedge \\ x \cdot 2x & 5 \cdot 7 \\ & 1 \cdot 35 \end{array}$$

$10x$ (above the middle line)
 $7x$ (below the middle line)

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can't have a negative dimension
throw out -5

Previous example cont'd:

(5)

$$\begin{array}{l|l|l} 2=0 & 2x-7=0 & x+5=0 \\ \text{never} & 2x=7 & x=-5 \\ \text{true} & x=\frac{7}{2} & \text{can't have a} \\ & & \text{negative dimension} \\ & & \text{throw out } -5 \end{array}$$

Only solution that works for width
is $x = \frac{7}{2}$

width: $x = \frac{7}{2} = 3\frac{1}{2}$

length: $4x+6$
 $= 4(\frac{7}{2})+6 = \frac{28}{2}+6 = 14+6 = 20$

The width is $3\frac{1}{2}$ inches and the length is 20 inches.

(Answer should include the units
(feet, inches, etc))

Check: 4 times width: $4(\frac{7}{2}) = \frac{28}{2} = 14$

6" more: 20" ✓

Area = $\frac{1}{2} \text{ in} (20 \text{ in}) = \frac{140 \text{ in}^2}{2} = 70 \text{ in}^2$ ✓

Ex.: The height of a triangle is 3 feet less than five times its base. The area of the triangle is 13 ft^2 . Find the base and height.

base: x
height: $5x-3$

height $\xrightarrow[\text{to}]{\text{compare}}$ base
 x

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$$\text{Area of triangle} = \frac{1}{2} (\text{base}) (\text{height})$$

$$13 = \frac{1}{2} x (5x - 3)$$

Multiply both sides by 2 to get rid of fraction:

$$2(13) = 2\left(\frac{1}{2}\right)x(5x - 3)$$

$$26 = x(5x - 3)$$

$$26 = 5x^2 - 3x$$

$$0 = 5x^2 - 3x - 26$$

$$0 = (5x - 13)(x + 2)$$

$$5x - 13 = 0$$

$$5x = 13$$

$$x = \frac{13}{5}$$

or

$$x + 2 = 0$$

$$x = -2$$

Throw out. A negative dimension does not make sense

$$\begin{array}{r} 5x^2 \quad 26 \\ \wedge \quad \wedge \\ 5x \cdot x \quad 1 \cdot 26 \\ \quad \quad \quad 13x \quad 2 \cdot 13 \\ \quad \quad \quad \text{low} \end{array}$$

$$\text{base: } x = \frac{13}{5} = 2\frac{3}{5} \text{ feet}$$

$$\text{height: } 5x - 3 = 5\left(\frac{13}{5}\right) - 3$$

$$= 13 - 3 = 10 \text{ ft}$$

The base is $2\frac{3}{5}$ feet and the height is 10 feet.

Check: 5 times base: $5\left(\frac{13}{5}\right) = 13$

3 ft less: 10 ft

$$\text{Area} = \frac{1}{2} \left(\frac{13}{5}\right) \left(10\right) = \frac{26}{2} \text{ ft}^2 = 13 \text{ ft}^2 \checkmark$$