Math 115

Spring 2018

Lecture 20

$? \; a^2 + b^2 = c^2 \; ?$

$y = mx + b \quad ? \quad d = rt$

Use $(A+B)^2 = A^2 + 2AB + B^2$ to Find

① $(7x + 5)^2 = (7x)^2 + 2(7x)(5) + (5)^2$

$= 49x^2 + 70x + 25$

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

$= 4x^6 + 4x^3y^4 + y^8$

③ $(8x^6 + 3x^4)^2 = (8x^6)^2 + 2(8x^6)(3x^4) + (3x^4)^2$

$= 64x^{12} + 48x^6x^4 + 9x^8$

$= 64x^{12} + 48x^{10} + 9x^8$

Use $(A-B)^2 = A^2 - 2AB + B^2$ to find

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

$= \boxed{16x^2 - 24x + 9}$

⑤ $(9x^3 - 5y^5)^2 = (9x^3)^2 - 2(9x^3)(5y^5) + (5y^5)^2$

$= \boxed{81x^6 - 90x^3y^5 + 25y^{10}}$

⑥ $(8x^7 - 4x^4)^2$

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

$= 64x^{14} - 64x^7x^4 + 16x^8$

$= \boxed{64x^{14} - 64x^{11} + 16x^8}$

Use $(A+B)(A-B) = A^2 - B^2$ to find

(Conjugates) (Difference of two Squares)

① $(7x+6)(7x-6)$

$= (7x)^2 - (6)^2 = \boxed{49x^2 - 36}$

② $(3x^5 - y^8)(3x^5 + y^8)$

$= (3x^5)^2 - (y^8)^2$

$= \boxed{9x^{10} - y^{16}}$

③ $(10x^7 + 7x^{10})(10x^7 - 7x^{10})$

$= (10x^7)^2 - (7x^{10})^2 = \boxed{100x^{14} - 49x^{20}}$

Division by Monomial:

$$\frac{24x^6y^3 - 15x^4y^5 - 9x^3y^6}{3x^3y^3}$$

$$= \frac{24x^6y^3}{3x^3y^3} - \frac{15x^4y^5}{3x^3y^3} - \frac{9x^3y^6}{3x^3y^3}$$

$$= 8x^3 - 5x^1y^2 - 3y^3$$

$$= 8x^3 - 5xy^2 - 3y^3$$

Divide:

$$\frac{40x^4 - 8x^3 + 16x^2}{-8x^3}$$

Division by Monomial

$$= \frac{40x^4}{-8x^3} - \frac{8x^3}{-8x^3} + \frac{16x^2}{-8x^3}$$

$x^{2-3} = x^{-1}$

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

Final Answer has to be without neg. exponent.

Divide: $\dfrac{x^3+5x^2-4x-2}{x-1}$

Binomial → Long Division

$x-1 \;\overline{)\; x^3+5x^2-4x-2}$

x^2+6x+2

$-(x^3-x^2)$

$6x^2-4x-2$

$-(6x^2-6x)$

$2x-2$

$-(2x-2)$

Remainder → 0

$x \cdot \boxed{x^2} = x^3$

$x \cdot \boxed{6x} = 6x^2$

$x \cdot \boxed{2} = 2x$

$\boxed{x^2+6x+2}$

Divide: $\dfrac{x^3+5x+15}{x+2}$

$x+2 \;\overline{)\; x^3+0x^2+5x+15}$

x^2-2x+9

$-(x^3+2x^2)$

$-2x^2+5x+15$

$-(-2x^2-4x)$

$9x+15$

$-(9x+18)$

-3

$x \cdot \boxed{x^2} = x^3$

$x \cdot \boxed{-2x} = -2x^2$

$x \cdot \boxed{9} = 9x$

Always

$\boxed{x^2-2x+9+\dfrac{-3}{x+2}}$

Divide: $\dfrac{30x^2+2-17x}{5x-2}$

$5x\boxed{6x}=30x^2$

$5x\boxed{-1}=-5x$

$6x-1$

$$\begin{array}{r} 6x-1 \\ 5x-2\,\overline{)\,30x^2-17x+2} \\ -(30x^2-12x) \\ \hline -5x+2 \\ -(-5x+2) \\ \hline 0 \end{array}$$

Divide: $\dfrac{y^3+3y^2-30}{y-2}$

$y\boxed{y^2}=y^3$

$y\boxed{5y}=5y^2$

$y\boxed{10}=10y$

Always

$$y^2+5y+10+\frac{-10}{y-2}$$

$$\begin{array}{r} y^2+5y+10 \\ y-2\,\overline{)\,y^3+3y^2+0y-30} \\ -(y^3-2y^2) \\ \hline 5y^2+0y-30 \\ -(5y^2-10y) \\ \hline 10y-30 \\ -(10y-20) \\ \hline \text{Rem.}\rightarrow -10 \end{array}$$

Divide $\dfrac{x^4 - 5x^2 - 36}{x^2 + 4}$

$x^2 \boxed{x^2} = x^4$

$x^2 \boxed{-9} = -9x^2$

$$\begin{array}{r} x^2 \quad -9 \\ x^2+4 \overline{\big)\, x^4 + 0x^3 - 5x^2 + 0x - 36} \\ -(x^4 \quad +4x^2 \quad\quad) \\ \hline -9x^2 \quad -36 \\ -(-9x^2 \quad -36) \\ \hline 0 \end{array}$$

$x^2 - 9$

Use exponential rules to Simplify:

① $x^{\frac{2}{3}} \cdot x^{\frac{1}{4}} = x^{\frac{2}{3}+\frac{1}{4}} = \boxed{x^{\frac{11}{12}}}$

$x^m \cdot x^n = x^{m+n}$

$\frac{2\cdot 4}{3\cdot 4} + \frac{1\cdot 3}{4\cdot 3}$

$= \frac{8}{12} + \frac{3}{12}$

$= \frac{11}{12}$

② $\left(x^{\frac{3}{5}}\right)^{10} = x^{\frac{3}{5}\cdot 10} = \boxed{x^6}$

$(x^m)^n = x^{m\cdot n}$

$\frac{3}{\cancel{5}} \cdot \cancel{10}^{2}$

$= \boxed{6}$

③ $\dfrac{x^{\frac{3}{8}}}{x^{1/4}} = x^{\frac{3}{8}-\frac{1}{4}} = \boxed{x^{\frac{1}{8}}}$

$\dfrac{x^m}{x^n} = x^{m-n}$

$\frac{3}{8} - \frac{1\cdot 2}{4\cdot 2}$

$= \frac{3}{8} - \frac{2}{8}$

$= \frac{1}{8}$

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

$= x^{\frac{5}{2}\cdot\frac{2}{5}}$

$= x^1 = \boxed{x}$

⑤ $\left(x^{-\frac{3}{4}}\right)^{\frac{4}{3}}$

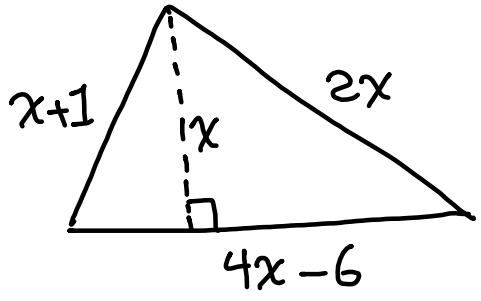
$= x^{-\frac{3}{4}\cdot\frac{4}{3}}$

$= x^{-1} = \boxed{\frac{1}{x}}$

⑥ $\left(\frac{-4x^{-5}}{3y^{-8}}\right)^{-2} = \left(\frac{-4y^8}{3x^5}\right)^{-2} = \left(\frac{3x^5}{-4y^8}\right)^2$

$= \boxed{\frac{9x^{10}}{16y^{16}}}$

Find Area & Perimeter in Simplest form



$P = a + b + c$

$A = \frac{bh}{2}$

$P = x+1+2x+4x-6$

$= \boxed{7x-5}$

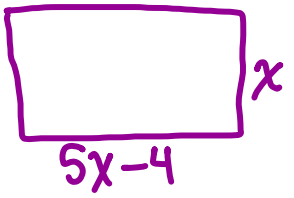
$A = \frac{x(4x-6)}{2} = \frac{1}{2}x(4x-6)$

$= \frac{1}{2}x\cdot 4x - \frac{1}{2}x\cdot 6$

$= \boxed{2x^2 - 3x}$

The length of a Rectangle is 4 ft shorter than 5 times its width.

① Draw & label such rectangle



② find P

$P = 2L + 2W$

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

$= \boxed{12x - 8}$

③ find A.

$A = LW$

$= (5x-4)x$

$= \boxed{5x^2 - 4x}$

Evaluate $\dfrac{x^2 - 4x}{x - 4}$ for

a) $x = 0$

$= \dfrac{0^2 - 4(0)}{0 - 4} = \dfrac{0}{-4} = \boxed{0}$

b) $x = -4$

$= \dfrac{(-4)^2 - 4(-4)}{-4 - 4} = \dfrac{16 + 16}{-8}$

$= \dfrac{32}{-8} = \boxed{-4}$

c) $x = 4$

$= \dfrac{4^2 - 4(4)}{4 - 4} = \dfrac{16 - 16}{0} = \dfrac{0}{0}$

Indeterminate

Simplify:

$(7.4 \times 10^{18}) \cdot (5.5 \times 10^{24})$

$= 40.7 \times 10^{42}$

$= 4.07 \times 10^{1} \times 10^{42} \Rightarrow \boxed{4.07 \times 10^{43}}$

Simplify

$$\frac{9.2 \times 10^{-5}}{4 \times 10^{23}}$$

$9.2 \div 4$

$= 2.3 \times 10^{-5-23}$

$= \boxed{2.3 \times 10^{-28}}$

Simplify:

$$(2x+3)^2 + (2x-3)^2$$

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

$$= 4x^2 + 12x + 9 + 4x^2 - 12x + 9$$

$$= \boxed{8x^2 + 18}$$

Find $(3x+2)^3$

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

use $(A+B)^2$

$$= (3x+2)(9x^2 + 12x + 4)$$

FOIL

$$= 27x^3 + 36x^2 + 12x + 18x^2 + 24x + 8$$

$$= \boxed{27x^3 + 54x^2 + 36x + 8}$$

Simplify

$$(2x+3)(2x-3)(4x^2+9)$$

(Conjugates)

$$=\left[(2x)^2-(3)^2\right](4x^2+9)$$

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

(Conjugates)

$$=(4x^2)^2-(9)^2$$

$$=\boxed{16x^4-81}$$

Class Quiz

① Find $(6x+5)(6x-5)$

② Divide: $\dfrac{x^2+2x+10}{x+5}$

③ Simplify: $(8\times10^{12})\cdot(2\times10^{37})$

SG 12, 13, and 14 due Monday

Project due Tuesday.

Find the measure of an angle such that the sum of 4 times its Complement and 3 times its Supplement is 739°.

Angle	Complement	Supplement
x	$90-x$	$180-x$

4 · Complement + 3 · Supplement = 739

$4(90-x)+3(180-x)=739$

$360-4x+540-3x=739$

$900-7x=739$

$-7x=739-900$

$-7x=-161$

$x=\frac{-161}{-7}$

$x=23$

23°

Find an angle such that the difference of twice the Supplement and 5 times its Complement is 6°.

$\square - \square = 6$

Angle	Complement	Supplement
x	$90-x$	$180-x$

2 · Suppl. − 5 · Comp. = 6

$2(180-x)-5(90-x)=6$

$360-2x-450+5x=6$

$-90+3x=6$

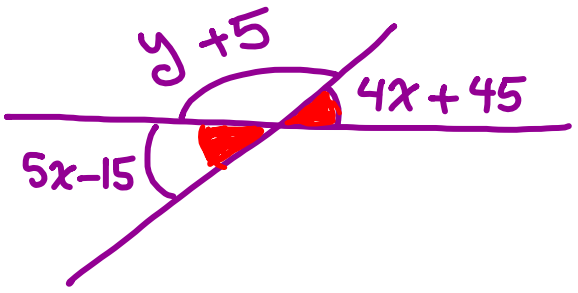
$3x=6+90$

$3x=96$

$x=32$

32°

Find x & y

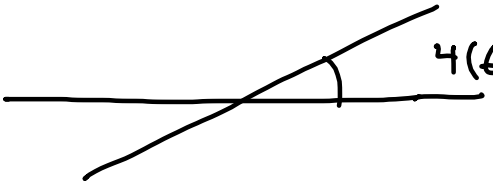


Vertical Angles

Must be equal

$5x-15=4x+45$

$\boxed{x=60}$

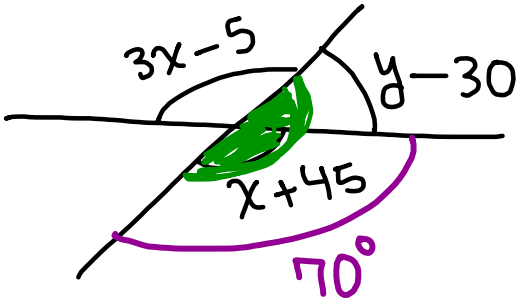


$4(60)+45 = 285$

Not practical

$\emptyset$

Find x & y



$3x-5 = x+45$

Vertical Angles

$3x-x = 45+5$

$2x = 50$

$\boxed{x=25}$

$\boxed{y-30} + \boxed{70} = 180°$

Straight angle

$y+40=180$

$\boxed{y=140}$

Find an angle such that its Supplement is 10° more than 5 times its Complement.

Angle	Comp.	Suppl.
x	$90-x$	$180-x$

Suppl. $= 5 \cdot$ Comp $+ 10$

$180-x = 5(90-x) + 10$

$180-x = 450-5x+10$

$-x+5x = 460-180$

$4x = 280$

$x = 70$

70°