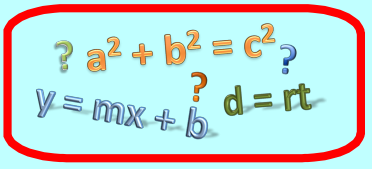
Math 115

Fall 2018

Lecture 25



Feb 19-8:47 AM

Factor Completely:

① $25x^2 - 81y^2$

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

$= (5x + 9y)(5x - 9y)$

② $20x^3 + 70x^2 - 40x$

$= 10x(2x^2 + 7x - 4)$

$= 10x(2x - 1)(x + 4)$

③ $125x^3 - 27y^3$

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

$= (5x - 3y)(25x^2 + 15xy + 9y^2)$

Dec 5-6:08 AM

Solve

1) $(2x-7)(3x+5)=0$

$2x-7=0$ $\quad$ $3x+5=0$

$\boxed{x=\frac{7}{2}}$ $\quad$ $\boxed{x=\frac{-5}{3}}$ $\quad$ $\left\{\frac{-5}{3},\frac{7}{2}\right\}$

2) $2x^2+6=13x$

$2x^2+6-13x=0$

$2x^2-13x+6=0$

$(2x-1)(x-6)=0$

By Z.F.P.,

$2x-1=0$ or $x-6=0$

$x=\frac{1}{2}$ $\quad$ $x=6$ $\quad$ $\left\{\frac{1}{2},6\right\}$

3) $x(x-20)=-100$

$x^2-20x=-100$

$x^2-20x+100=0$

$(x-10)(x-10)=0$

By Z.F.P.

$x-10=0$ $\quad$ $x-10=0$

$x=10$ $\quad$ $\{10\}$ Repeated Ans

Dec 5-6:16 AM

Use quadratic formula to Solve

$x^2+4=5x$

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

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

$a=1$, $b=-5$, $c=4$

$b^2-4ac=(-5)^2-4(1)(4)$

$=25-16$

$=\boxed{9}$

$ax^2+bx+c=0$

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

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

$x=\frac{-(-5)\pm\sqrt{9}}{2(1)}$

$=\frac{5\pm3}{2}$ $\quad$ $\{1,4\}$

$x=\frac{5+3}{2}=\boxed{4}$ $\quad$ $x=\frac{5-3}{2}=\boxed{1}$

Dec 5-6:26 AM

Solve $3x^2 = 11x + 20$ by quadratic formula.

$3x^2 - 11x - 20 = 0$

$a = 3 \quad b = -11 \quad c = -20$

$b^2 - 4ac = (-11)^2 - 4(3)(-20)$

$= 121 + 240$

$= 361$

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

$x = \frac{-(-11) \pm \sqrt{361}}{2(3)}$

$= \frac{11 \pm 19}{6}$

$x = \frac{11+19}{6} = \frac{30}{6} = \boxed{5}$

$x = \frac{11-19}{6} = \frac{-8}{6} = \boxed{\frac{-4}{3}}$

$\left\{\frac{-4}{3}, 5\right\}$

Dec 5-6:31 AM

Solve $(2x+1)(3x+5) = 3$ by using quadratic formula. Hint: FOIL, Simplify, write in $ax^2 + bx + c = 0$ form.

$6x^2 + 10x + 3x + 5 - 3 = 0$

$6x^2 + 13x + 2 = 0$

$a = 6 \quad b = 13 \quad c = 2$

$b^2 - 4ac = (13)^2 - 4(6)(2)$

$= 169 - 48$

$= 121$

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

$x = \frac{-13 \pm \sqrt{121}}{2(6)}$

$= \frac{-13 \pm 11}{12}$

$x = \frac{-13+11}{12} = \frac{-2}{12} = \boxed{\frac{-1}{6}}$

$x = \frac{-13-11}{12} = \frac{-24}{12} = \boxed{-2}$

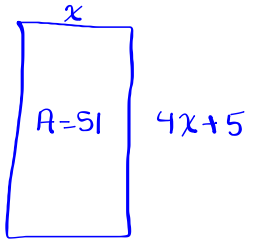
$\left\{-2, \frac{-1}{6}\right\}$

Dec 5-6:39 AM

Area of a rectangular room is $51 m^2$.

The width is 5 m longer than 4 times its length.

Find its dimensions.



$A = 51$ $\quad A = LW$

$x(4x+5) = 51$

$4x^2 + 5x - 51 = 0$

$a=4 \quad b=5 \quad c=-51$

$b^2-4ac = 5^2-4(4)(-51)$

$= 25 + 816 = 841$

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

$x = \frac{-5 \pm \sqrt{841}}{2(4)}$

$x = \frac{-5 \pm 29}{8}$

$x = \frac{-5+29}{8} = \frac{24}{8} = 3$

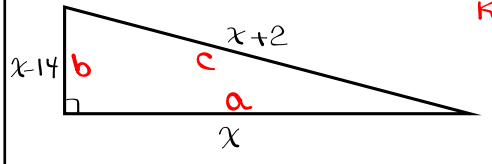
$x = \frac{-5-29}{8} = -\#$

3m $\quad A = 51 m^2$

17m

Dec 5-6:50 AM

In the right triangle ABC, one leg is 14 inches shorter than the other leg. Hypotenuse is 2 inches longer than the longer leg. Find all three sides.



Right Triangle

$a^2 + b^2 = c^2$

Pythagorean thrm

$x^2 + (x-14)^2 = (x+2)^2$

$x^2 + (x-14)(x-14) = (x+2)(x+2)$

$x^2 + x^2 - 14x - 14x + 196 = x^2 + 2x + 2x + 4$

$x^2 - 28x + 196 - 4x - 4 = 0$

$x^2 - 32x + 192 = 0$

Dec 5-6:58 AM

$x^2 - 32x + 192 = 0$

$a=1 \quad b=-32 \quad c=192$

$x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$ $\qquad x = \dfrac{-(-32) \pm \sqrt{256}}{2(1)}$

$b^2-4ac = (-32)^2 - 4(1)(192)$

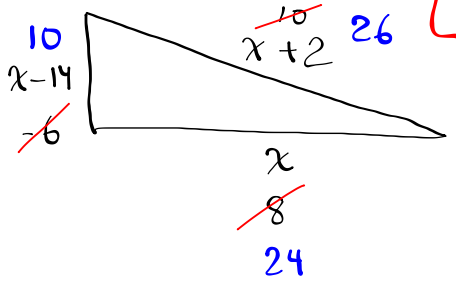
$= 256$

$= \dfrac{32 \pm 16}{2}$

3 sides are 10, 24, and 26 in.

$x = \dfrac{32+16}{2} = \dfrac{48}{2} = 24$ ✓

$x = \dfrac{32-16}{2} = \dfrac{16}{2} = 8$



check

$10^2 + 24^2 = 26^2$

$100 + 576 = 676$ ✓

Dec 5-7:08 AM

The sum of the squares of two consecutive odd integers is equal to 103 more than their product. Find all such odd integers.

x & $x+2$

x	$x+2$
9	11
-11	-9

$x^2 + (x+2)^2 = x(x+2) + 103$

$x^2 + (x+2)(x+2) = x(x+2) + 103$

$x^2 + x^2 + 2x + 2x + 4 = x^2 + 2x + 103$

$x^2 + 2x - 99 = 0$

9 & 11 or -11 & -9

$a=1 \quad b=2 \quad c=-99$

$x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a} = \dfrac{-2 \pm \sqrt{400}}{2} = \dfrac{-2 \pm 20}{2}$

$b^2-4ac = 2^2 - 4(1)(-99) = 400$

$x = \dfrac{-2+20}{2} = \dfrac{18}{2} = 9$

$x = \dfrac{-2-20}{2} = \dfrac{-22}{2} = -11$

Dec 5-7:13 AM

New Chapter

Rational Expressions $\frac{\text{Polynomial}}{\text{Polynomial}}$

$\frac{3x+7}{2x-5}$, $\frac{x^2-4}{x^3-8}$, $\frac{x^2-8x+15}{x^2-25}$

To Simplify/reduce a rational expression

1) factor numerator Completely

2) factor denominator Completely

3) Cross-out any Common factor

Dec 5-7:40 AM

Reduce $\frac{3x+15}{4x+20} = \frac{3(x+5)}{4(x+5)} = \boxed{\frac{3}{4}}$

Reduce $\frac{x^2-7x}{2x-14} = \frac{x(x-7)}{2(x-7)} = \boxed{\frac{x}{2}}$

Reduce $\frac{x^2-25}{x^2+8x+15} = \frac{(x+5)(x-5)}{(x+5)(x+3)}$

$= \boxed{\frac{x-5}{x+3}}$

Dec 5-7:44 AM

Reduce:

① $\dfrac{x^2-5x-14}{x^2+x-2}$

$= \dfrac{(x-7)(x+2)}{(x+2)(x-1)}$

$= \boxed{\dfrac{x-7}{x-1}}$

② $\dfrac{xy+4x-3y-12}{xy+4x+5y+20}$

$= \dfrac{x(y+4)-3(y+4)}{x(y+4)+5(y+4)}$

$= \dfrac{(y+4)(x-3)}{(y+4)(x+5)}$

$= \boxed{\dfrac{x-3}{x+5}}$

Dec 5-7:50 AM

How to multiply rational expressions:

1) Factor all numerators Completely

2) Factor all denominators Completely

3) Cross-out any Common factors

Multiply:

$\dfrac{x^2+3x+2}{x^2+5x+4} \cdot \dfrac{x^2+10x+24}{x^2+5x+6} = \dfrac{(x+2)(x+1)}{(x+1)(x+4)} \cdot \dfrac{(x+4)(x+6)}{(x+2)(x+3)}$

$= \dfrac{x+6}{x+3}$

Dec 5-7:59 AM

Multiply:

$$\frac{x^2-x-6}{x^2-2x-8} \cdot \frac{x^2+7x+12}{x^2-9}$$

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

$$= \boxed{\frac{x+4}{x-4}}$$

Dec 5-8:05 AM

Divide: $\frac{x^2-3x+2}{x^2+4x+3} \div \frac{x-1}{x+1}$

$$= \frac{x^2-3x+2}{x^2+4x+3} \cdot \frac{x+1}{x-1}$$

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

$$= \boxed{\frac{x-2}{x+3}}$$

Dec 5-8:10 AM

Divide: $\dfrac{2x^2-5x-12}{x^2-10x+24} \div \dfrac{4x^2-9}{x^2-9x+18}$

$= \dfrac{2x^2-5x-12}{x^2-10x+24} \cdot \dfrac{x^2-9x+18}{4x^2-9}$

$= \dfrac{(2x+3)(x-4)}{(x-6)(x-4)} \cdot \dfrac{(x-6)(x-3)}{(2x+3)(2x-3)}$

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

Dec 5-8:14 AM

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

$= \dfrac{2x^2-x-1}{2x^2+5x+3} \cdot \dfrac{2x^2+x-3}{4x^2-1}$

$= \dfrac{(2x+1)(x-1)}{(2x+3)(x+1)} \cdot \dfrac{(2x+3)(x-1)}{(2x+1)(2x-1)}$

$= \boxed{\dfrac{(x-1)^2}{(x+1)(2x-1)}}$

Dec 5-8:21 AM

Simplify $\frac{4}{9} + \frac{2}{9} = \frac{4+2}{9}$

$= \frac{6}{9} = \frac{2 \cdot 3}{3 \cdot 3} = \boxed{\frac{2}{3}}$

Simplify: $\frac{x-1}{x+3} + \frac{4}{x+3} = \frac{x-1+4}{x+3}$

$= \frac{x+3}{x+3} = \boxed{1}$

Dec 5-8:28 AM

Simplify: $\frac{x^2-8x}{x-3} + \frac{15}{x-3}$

$= \frac{x^2-8x+15}{x-3}$

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

Dec 5-8:31 AM

Simplify: $\dfrac{x^2-3x}{x+3} - \dfrac{18}{x+3}$

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

$= \dfrac{(x+3)(x-6)}{x+3} = \boxed{x-6}$

Dec 5-8:34 AM

Simplify: $\dfrac{4x}{x^2-4} - \dfrac{3x+2}{x^2-4}$

$= \dfrac{4x-3x-2}{x^2-4}$

$= \dfrac{x-2}{x^2-4} = \dfrac{1(x-2)}{(x+2)(x-2)}$

$= \boxed{\dfrac{1}{x+2}}$

Dec 5-8:38 AM

Simplify:

$$\frac{2x-3}{x^2+5x+6} - \frac{x-5}{x^2+5x+6}$$

$$= \frac{2x-3-x+5}{x^2+5x+6} = \frac{x+2}{x^2+5x+6}$$

Due Thursday

SG 1.5 & 1.6

$$= \frac{1(x+2)}{(x+3)(x+2)}$$

$$= \boxed{\frac{1}{x+3}}$$

Dec 5-8:43 AM

Graph of $y = 2x^2+5x-7$ has two x-intercepts. Find both of them.

x-Int $\rightarrow y=0 \rightarrow 2x^2+5x-7=0$

by Factoring

$(2x+7)(x-1)=0$

using Z.F.P.

$2x+7=0$ or $x-1=0$

$\boxed{x=\frac{-7}{2}}$ $\boxed{x=1}$

x-Ints are $\left(\frac{-7}{2},0\right)$ & $(1,0)$.

Dec 5-8:48 AM