

Lesson 95- SWBAT solve using partial fractions.
 Kickstart
 Place your weekly HW quiz on the desk!!
 1) Find the equation of the hyperbola, state its key features (center, foci, vertices) and graph.
 $-16x^2 + 9y^2 + 32x + 144y - 16 = 0$
 2) Solve: $\frac{x+2}{x^2-2} + \frac{6}{x^2-1}$
 ① $-16x^2 + 32x + 9y^2 + 144y + 16 = 0$
 $-16(x^2 - 2x) + 9(y^2 + 16y) = -16$
 $-16(x-1)^2 + 9(y+8)^2 = -576$
 $= \frac{(x-1)^2}{36} - \frac{(y+8)^2}{64} = 1$
 $\frac{(y+8)^2}{64} - \frac{(x-1)^2}{36} = -1$
 C (1, -8)
 $a = \frac{6}{4} = \frac{3}{2}$
 $b = \frac{8}{3}$
 vertices
 (1, 0) (1, -16)
 $\frac{c^2}{a^2} = \frac{b^2}{b^2} = \frac{c^2}{a^2}$ (1, 2)
 $\frac{64}{9} = \frac{c^2}{\frac{9}{4}}$ (1, -18)
 $c = 10$
 ② $\frac{x+2}{x^2-2} + \frac{6}{x^2-1}$
 $\frac{x+2}{(x-1)(x+1)} + \frac{6}{(x-1)(x+1)}$
 $\frac{x^2+2x+2}{(x-1)(x+1)} + \frac{6x}{(x-1)(x+1)}$

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Partial Fractions- decomposing an algebraic fraction.
 You are working backwards!! You are given the answer and must be able to come up with the fractions that you started with
 Partial Fractions Steps:
 1) Factor the denominator.
 2) Write the factors as two separate fractions with A, B and C (however many needed) as numerators.
 3) Find common denominators and start solving like a rational equation.
 4) Set ONLY the numerators equal once you have common denominators.
 5) Make two equations: one with x-values and the other with other numbers.
 6) Solve for the missing letters by using a system (A, B, C)
 7) Write the fractions to show the decomposition.
 Example 1:
 $\frac{3x+2}{x^2+x} = \frac{3x+2}{x(x+1)} = \frac{A(x)}{x(x+1)} + \frac{B(x)}{x(x+1)}$
 $\frac{3x+2}{x(x+1)} = \frac{Ax+A+Bx}{x(x+1)}$
 $3x+2 = Ax+A+Bx$
 $3x = Ax+Bx \rightarrow 3 = A+B$
 $3 = 2+B \quad 2 = A$
 $B = 1$
 $\frac{A}{x} + \frac{B}{x+1} \rightarrow \frac{2}{x} + \frac{1}{x+1}$

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Example 2:
 $\frac{5x+4}{x^2-x-2} = \frac{5x+4}{(x-2)(x+1)} = \frac{A(x)}{x-2} + \frac{B(x)}{x+1}$
 $\frac{5x+4}{(x-2)(x+1)} = \frac{Ax+A+Bx-2B}{(x-2)(x+1)}$
 $5x+4 = Ax+A+Bx-2B$
 $5x = Ax+Bx \rightarrow 5 = A+B$
 $10 = 2A+2B \quad -4 = A-2B$
 $-4 = A-2B$
 $\frac{6 = 3A}{2 = A} \quad 5 = A+B$
 $5 = 2+B$
 $B = 3$
 $\frac{2}{x-2} + \frac{3}{x+1}$

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Example 3:
 $\frac{x-3}{x^3+3x} = \frac{x-3}{x(x^2+3)} = \frac{A(x^2)}{x(x^2+3)} + \frac{Bx+C}{x(x^2+3)}$
 $\frac{x-3}{x(x^2+3)} = \frac{Ax^2+3A+Bx^2+Cx}{x(x^2+3)}$
 $0x^2+x-3 = Ax^2+3A+Bx^2+Cx$
 $0x^2 = Ax^2+Bx^2 \rightarrow 0 = A+B$
 $x = Cx \quad 1 = C$
 $-3 = 3A \quad 0 = -1+B \quad -3 = 3A$
 $A = -1 \quad B = 1$
 $\frac{-1}{x} + \frac{x+1}{x^2+3}$

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