

Math 18)

Monday, March 1

Section 7.5 (part 1)

WW ✓

243 | 6951

Polynomial Division

$$\underline{\text{Ex}} \quad \frac{6x^5 + 21x^4 + 13x^3 - 2x^2 + 9x - 1}{3x^3 + 6x^2 - x + 3}$$

$$= \underline{2x^2 + 3x - 1} + \frac{x^2 - x + 2}{3x^3 + 6x^2 - x + 3}$$

← lesser degree than

EZ anti derivative

$$\underline{\text{Ex}} \quad \frac{3x^2 + 19x + 10}{2x^3 + 9x^2 + 10x + 3} = \frac{\quad}{(2x+1)(x+3)(x+1)}$$

$$= \frac{A}{2x+1} + \frac{B}{x+3} + \frac{C}{x+1}$$

Tue - 7.5/7.7

Thu - 7.7

Fri - 7.8

BYOB - solo outdoor sports

$$3x^3 + \dots \overline{) \begin{array}{r} 2x^2 + 3x^2 - 1 \\ 6x^5 + \dots \\ - 6x^5 + \dots \end{array}}$$

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

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

$$(1)^2 - 3(1) + 2$$

$$1 - 3 + 2 = 0$$

$$\underbrace{\quad}_{x^2 - x + 2}$$

Partial Fraction Decomposition

$$\frac{E_x}{(x+1)^2 (x-3)^5} = \frac{A}{x+1} + \frac{B}{(x+1)^2} + \frac{C}{x-3} + \frac{D}{(x-3)^2} + \frac{E}{(x-3)^3} + \frac{F}{(x-3)^4} + \frac{G}{(x-3)^5}$$

linear

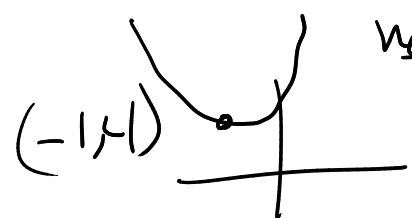
$$\frac{E_x}{(x-2)^3 (x^2+2x+5)^4} = \frac{A}{x-2} + \frac{B}{(x-2)^2} + \frac{C}{(x-2)^3} + \frac{Dx+E}{(x^2+2x+5)} + \frac{Fx+G}{(x^2+2x+5)^2} + \frac{Hx+K}{(x^2+2x+5)^3} + \frac{Lx+M}{(x^2+2x+5)^4}$$

linear

quadratic, does not have real roots

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

never zero



11 equations in 11 variables
linear
Anti derivatives like

$$\int \frac{2}{(x-2)^3} dx, \int \frac{2x+3}{(x^2+2x+5)^3} dx$$

EZ

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

$$x+1 = 2 \tan \theta$$

Multiply both sides by $(2x+1)(x+3)(x+1)$

$$3x^2 + 19x + 10 = \frac{A(2x+1)(x+3)(x+1)}{(2x+1)} + \frac{B(2x+1)(x+3)(x+1)}{x+3} + \frac{C(2x+1)(x+3)(x+1)}{x+1}$$

$$= A(x^2 + 4x + 3) + B(2x^2 + 3x + 1) + C(2x^2 + 7x + 3)$$

$$= (A + 2B + 2C)x^2 + (4A + 3B + 7C)x + (3A + B + 3C)$$

$$\Rightarrow A + 2B + 2C = 3$$

$$4A + 3B + 7C = 19$$

$$3A + B + 3C = 10$$

solve this linear system

$$A = 1, B = -2, C = 3$$

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

$$\int \frac{3x^2 + 19x + 10}{2x^3 + 9x^2 + 10x + 3} dx = \int \frac{1}{2x+1} dx + \int \frac{-2}{x+3} dx + \int \frac{3}{x+1} dx$$

$$= \frac{1}{2} \ln |2x+1| - 2 \ln |x+3| + 3 \ln |x+1| + C$$

$$= \ln \sqrt{2x+1} + \ln (x+3)^{-2} + \ln (x+1)^3 + C$$

$$= \ln \frac{\sqrt{2x+1} (x+1)^3}{(x+3)^2} + C$$