Math 213

Q's

$$\frac{2x^4+x^2-3}{(x+2)^2(x-3)(x^2+1)} = \frac{A}{x+2} + \frac{B}{(x+2)^2} + \frac{C}{x-3} + \frac{Dx+E}{x^2+1}$$

$$2x^4+x^2-x = A(x+2)(x-3)(x^2+1) + B(x-3)(x^2+1) + C(x+2)^2(x^2+1) + (Dx+E)(x+2)^2(x-3)$$

by textbook Profs: $-2, 3, \pm i$ — but x = anything → eqn for system of eqn's

but $x=3$ $\quad 2(3)^4+3^2-3 = C(3+2)^2(3^2+1)$

but $x=-2$

(VS) equality of polynomials

$$2x^4+x^2-x = A(x^4-x^3-5x^2-x-6) + B(x^3-3x^2+x-3) + C(x^4+4x^3+5x^2+4x+4) + D(x^4+x^3-8x^2-12x) + E(x^3+x^2-8x-12)$$

x^4: $A+C+D = 2$

x^3: $-A+B+4C+D+E = 0$

x^2: $-5A-3B+5C-8D+E = 1$

x: $-A+B+4C-12D-8E = -1$

const: $-6A-3B+4C-12E = 0$

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

Profs: $-1, 2, -3$

$$1 = A(x-2)(x+3) + B(x+1)(x+3) + C(x+1)(x-2)$$

but $x=2$ $\quad B = \frac{1}{15}$ etc

$$\int \frac{1+0^{e^x-e^x}}{1+e^x}\,dx = \int \frac{(1+e^x)-(e^x)}{1+e^x}\,dx$$

be creative!

$$\int e^{-x}\cdot\left(\frac{e^x}{1+e^x}\right)dx \qquad \int \frac{1+e^x}{1+e^x}-\frac{e^x}{1+e^x}\,dx$$

$$\rightarrow \int \left(1-\frac{e^x}{1+e^x}\right)dx$$

$$\int \frac{1}{(1+e^x)}\,dx = \int \frac{1}{u}\frac{du}{u-1} = \int \frac{1}{u(u-1)}\,du$$

$u = 1+e^x \rightarrow e^x = u-1$

$du = e^x dx \rightarrow dx = \dfrac{du}{u-1}$

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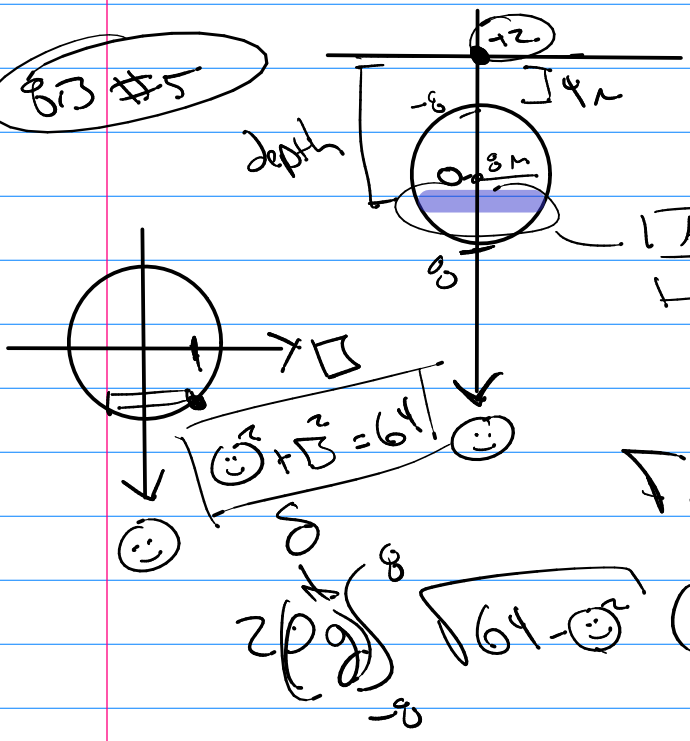
§13 #5



$F_i = (\delta)(\text{area})(\text{depth})$

$\text{area} \approx \text{width}\cdot\Delta y$

$\text{width} = 2D = 2\sqrt{64-y^2}$

$F_i = (\delta)(2\sqrt{64-y^2}\,dy)(y+12)$

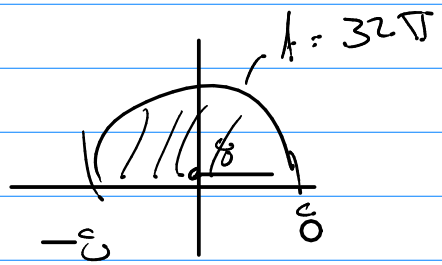
$$2(\delta)\int_{-8}^{8}\sqrt{64-y^2}\,(y+12)\,dy$$

$$28\int_{-8}^{8}\sqrt{64-\odot^2}\,(\odot+12)\,d\odot$$

$$= 28\left[\int_{-8}^{8}\odot\sqrt{64-\odot^2}\,d\odot + 12\int_{-8}^{8}\sqrt{64-\odot^2}\,d\odot\right]$$

$$u = 64-\odot^2$$

$$du = -2\odot\,d\odot$$



$$= 28\left[-\frac{1}{2}\int_{0}^{0}\sqrt{u}\,du\right]$$

Ch 9 Differential Equations

① eqn's see $r = y$ | expression | = | expression |

can now include $\frac{d}{dx}[\,]$

ex $\frac{dT}{dt} = -3T$

② Soln → find an equation for a function such that it make the dif eqn true.

ex $\frac{df}{dt} = k\cdot f \longrightarrow f(t) =$ expression

find?

→ Solving: Seperable:

$$\frac{dT}{dt} = -3T$$

$T = ?$

$$\frac{1}{T}\,dT = -3\,dt$$

$$\int \frac{1}{T}\,dT = \int -3\,dt$$

$$\ln T = -3t + C$$

$$T = e^{-3t+C}$$

$$T = e^{-3t} \cdot e^{C} = C$$

$$\boxed{T = C e^{-3t}}$$