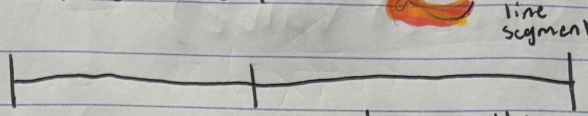
Pt. 1

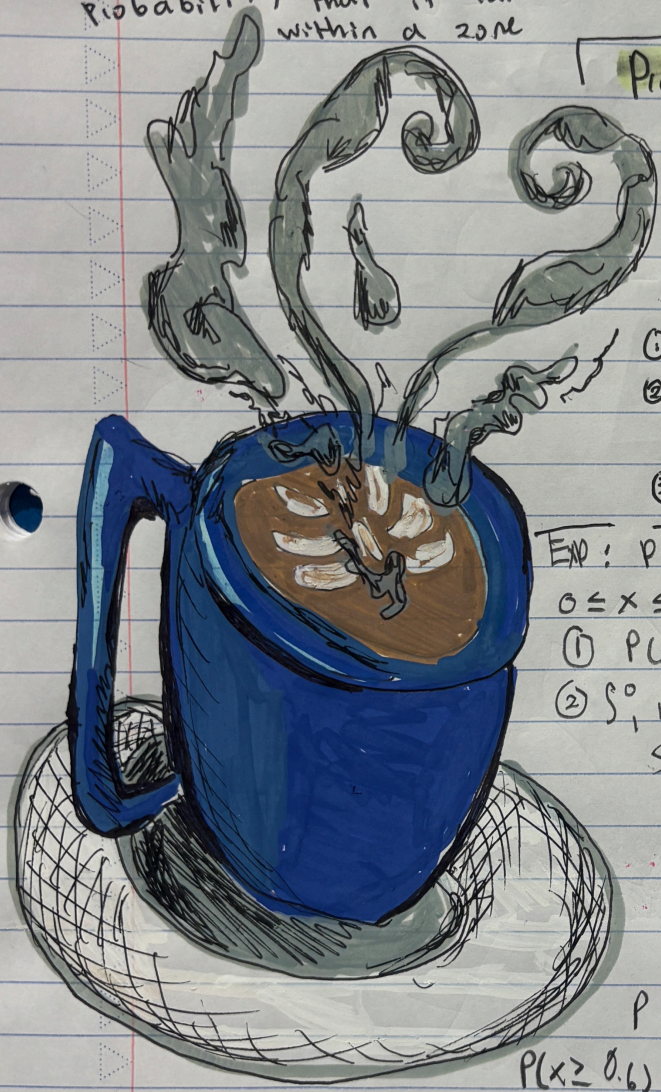
MATH Studying : Feb 4th : Probability

aplications of intigration

its not the Probability of one number its the 0 Probability that it falls within a zone



Probability 0 ⇒ beacuse thier are an infinite number of possibilitys, However that doesnt mean guessing it is impossible



Probability Density funct. (PDf)

for a function to be a PDf $P(x)$ must

① $P(x) \geq 0$

② $\int_S P(x)\,dx = 1$ (the sum of all Probibilitics must be 100%; S is sample space)

③ $P(a \leq x \leq b) = \int_a^b P(x)\,dx$

EXP: $P(x) = 12x^2 - 12x^3$

$0 \leq x \leq 1$

① $P(x) \geq 0$ ✓ yes

② $\int_1^0 12x^2 - 12x^3\,dx = 4x^3 - 3x^4 \Big|_0 = 4 - 3 = 1$ ✓ yes

So $P(0.4 \leq x \leq 0.7)$

$$\int_{.4}^{.7} 12x^2 - 12x^3\,dx \Rightarrow 4x^3 - 3x^4 \Big|_{.4}^{.7}$$

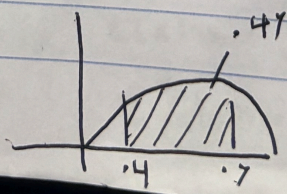
$= .4725 \rightarrow$ **47.25%**

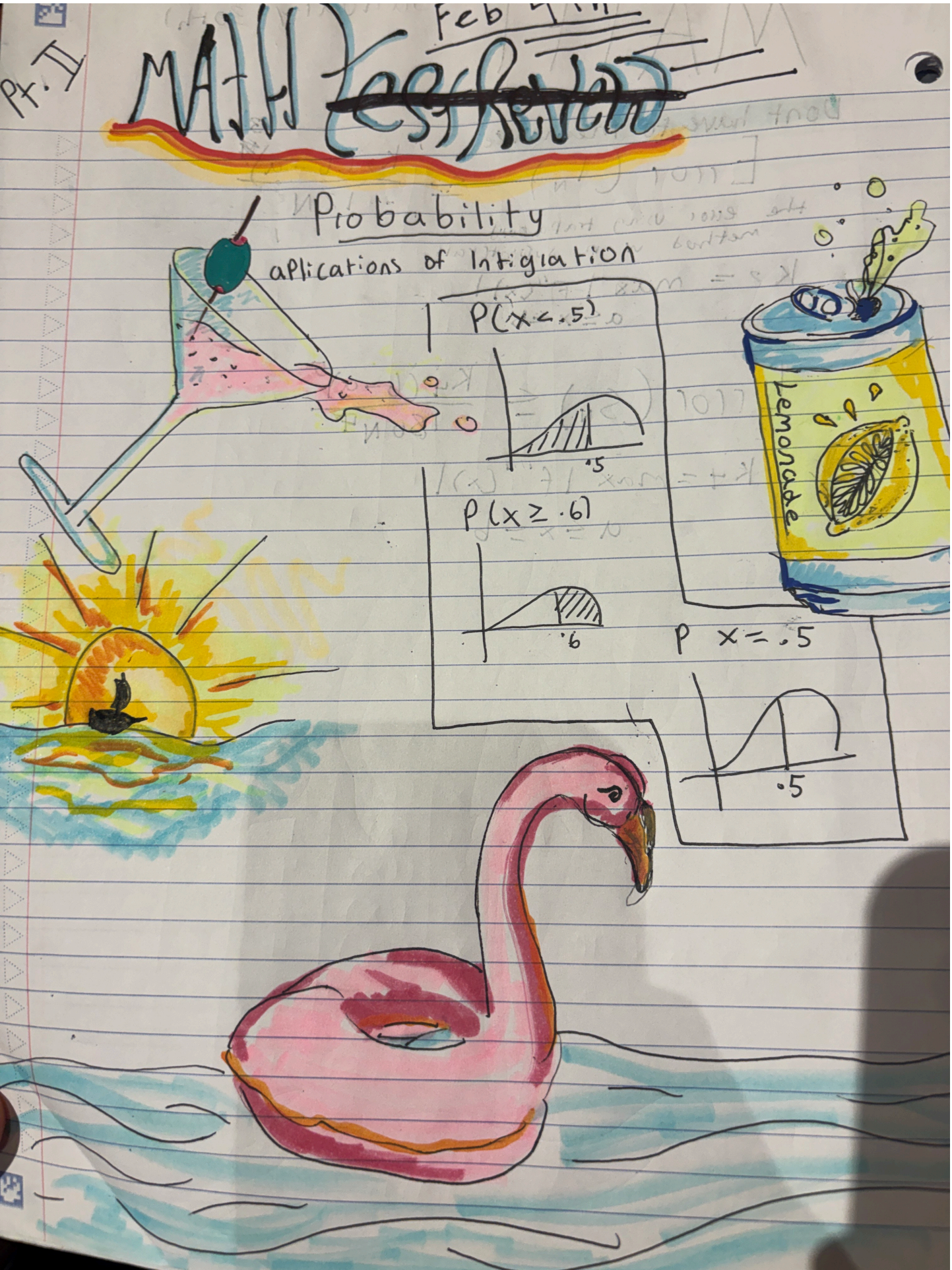
$P(x \leq 0.5) \Rightarrow \int_0^{.5} 12x^2 - 12x^3\,dx \rightarrow .3125$ **31.25%**

$P(x \geq 0.6) \int_{0.6}^{1} 12x^2 - 12x^3\,dx = .5243 \rightarrow$ **52.43%**

$P(x = .5) = 0$ bc $\int_{0.5}^{0.5} 12x^2 - 12x^3\,dx$

$P(0.4 \leq x \leq 0.7)$




Pt. II
MATH
Probability
aplications of Intigiation
P(x<.5)
.5
P(x≥.6)
.6
P x=.5
.5
Lemonade

Math Feb 4th III

Exp 2 $P(x) = \frac{50}{(x+50)^2} \quad x \geq 0$

do your checks

① $P(x) \geq 0$ $\frac{50}{(x+50^2)^{-2}} \to +$ ✓ yes

② $\int_0^\infty \frac{50}{(x+50)^2} \quad \frac{-50}{(x+50)^2}\Big|_0^\infty \quad 0-(-1)=1$ ✓ yes

$P(10 \leq x \leq 20) = \int_{10}^{20} \frac{50}{(x+50)^2}\,dx$

$= \frac{-50}{x+50}\Big|_{10}^{20} = \frac{5}{42}$

$P(x \geq 25) \int_{25}^{\infty} \frac{50}{(x+50)^2}\,dx \to -\frac{50}{(x+50)}\Big|_{25}^{\infty} = \frac{2}{3}$

Exp 3 $P(x) = \frac{ce^{-x}}{1+e^{-2x}} \quad -\infty < x < \infty$

What value of c makes $P(x)$ a P.d.F?

① $P(x) \geq 0 \quad \frac{c(e^{-x})}{+(1-e^{-2x})} \geq 0 \to c > 0$

② $\int_{-\infty}^{\infty} \frac{ce^{-x}}{1+e^{-2x}}dx = 1 \quad u = e^{-x} \quad \frac{du}{-e^{-x}} = dx \quad \frac{ce^{-x}}{1-u^2}\frac{du}{e^{-x}}$

$-c \arctan(e^{-x})\Big|_{-\infty}^{\infty} \quad -c\left(0-\frac{\pi}{2}\right) = \frac{c\pi}{2} = 1$

$\boxed{c = \frac{2}{\pi}}$

Exp 4: $P(x) = c\ln x \quad [1, e]$ so $c > 0$

① $P(x) \geq 0 \quad c\ln x \geq 0$ (ln x: 0 at 1, + after)

② $\int_1^e c\ln x\,dx = 1$

$u = \ln x \quad dv = 1dx$

$du = \frac{1}{x} \quad v = x$

$c(x\ln x - \int \frac{1}{x} x\,dx)$

$c(x\ln x - x)\Big|_1^e \to c(e\ln e - e) - (1\ln 1 - 1) = 1$

$\boxed{c = 1}$

Math

Feb 4 IV

Mean (expected value)

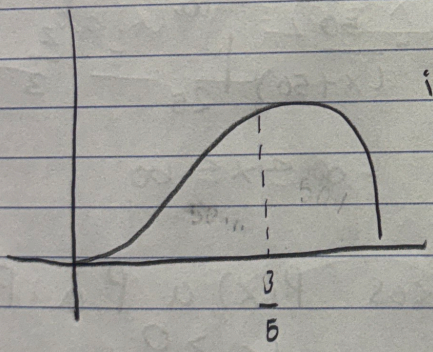
$\sum$(N Outcome · N Probability outcome)

$\mu \equiv$ mean $= \int_S x P(x)\, dx$

Exp $P(x)$ $12x^2 - 12x^3$ $0 \leq x \leq 1$

$$\mu = \int_0^1 x(12x^2 - 12x^3)\, dx = \int_0^1 12x^3 - 12x^4\, dx$$

$$= 3x^4 - \frac{12}{5}x^5 \Big|_0^1 = \boxed{\frac{3}{5}}$$



if u cut it out of paper and balanced a pencil on it it would stay?