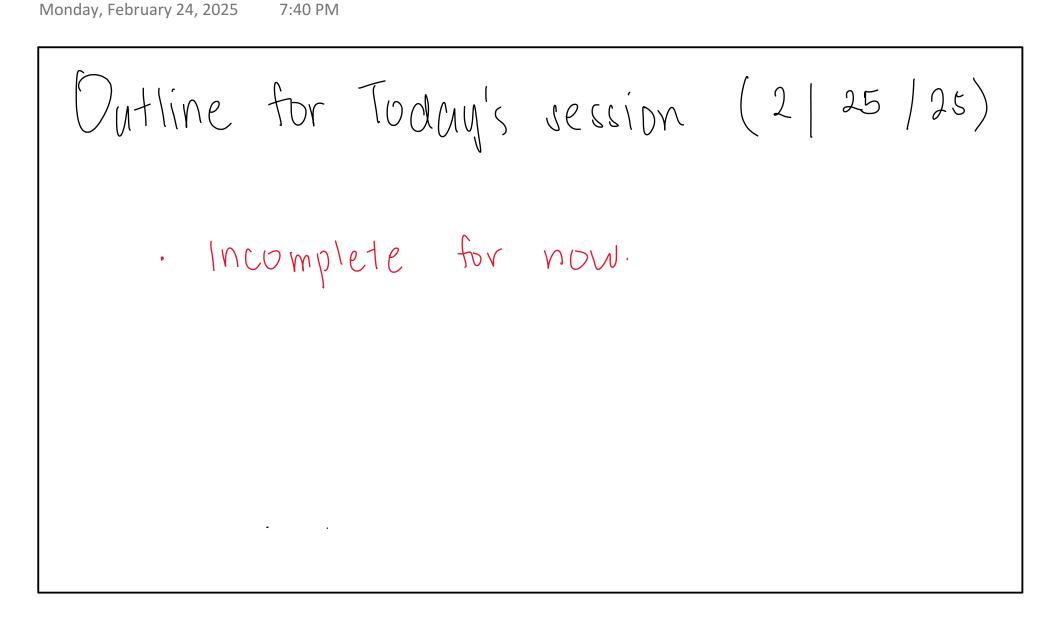
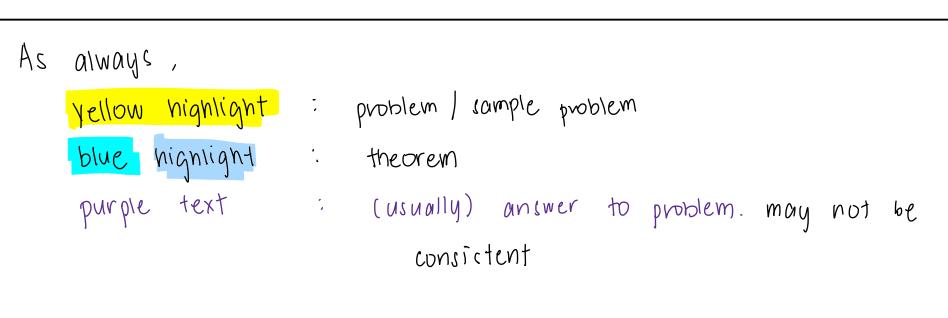
Integration of Log/Exp





Theorem

$$\frac{d}{dx}(\ln(x)) = \frac{1}{x}$$

$$\int \frac{1}{x} dx = \ln(x) + C$$

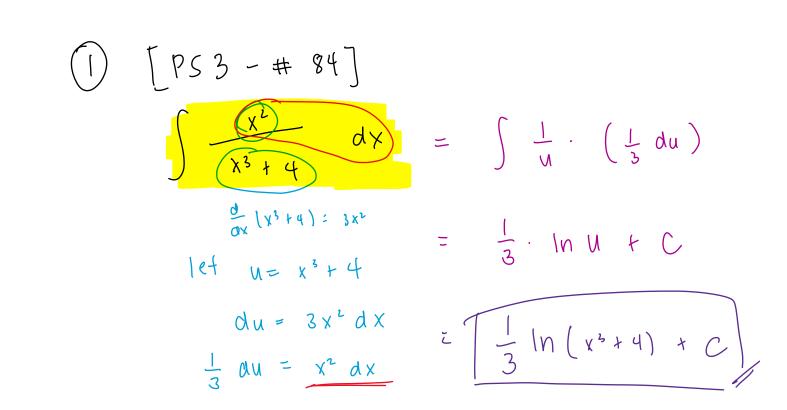
$$\frac{d}{dx}(e^{x}) = e^{x}$$

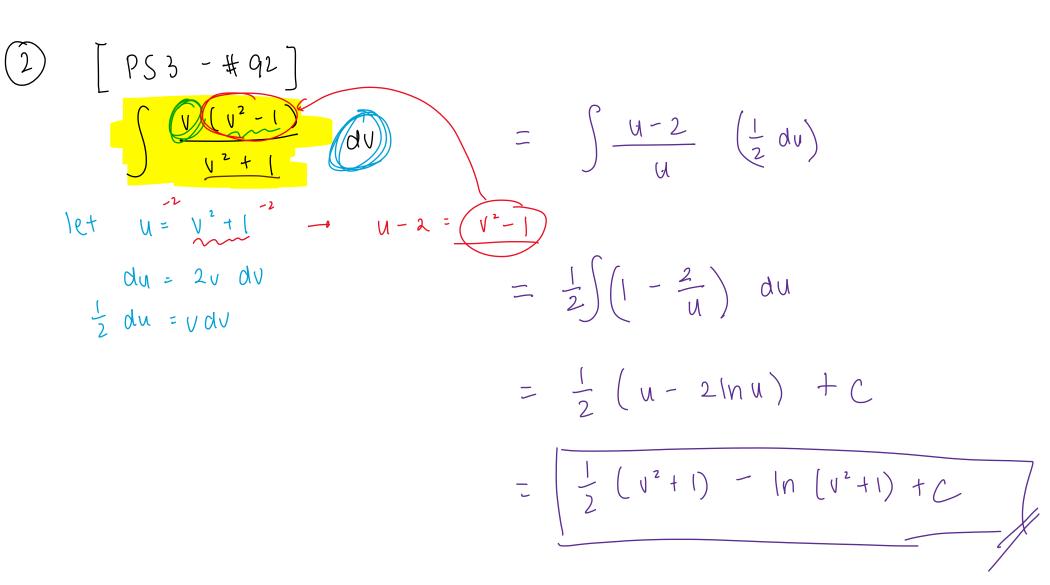
$$\int e^{x} dx = e^{x} + C$$

$$\frac{d}{dx}(\alpha^{x}) = \ln(\alpha) \cdot \alpha^{x}$$

$$\int \alpha^{x} dx = \frac{\alpha^{x}}{\ln \alpha} + C$$

Poblems





May or may not be important

Q: Why is
$$\frac{d}{dx}(a^x) = (\ln a) a^x$$
?

A: MAIN CONCEPT: Property of log 0 108 m p = p

We know
$$\frac{d}{dx}(e^x) = e^x$$
.
Also, from properties of log, $a = e^{\ln a}$

 $\frac{d}{dx}(a^{x}) = \frac{d}{dx}((e^{\ln a})^{x})$ Thain

The rule $= \frac{d}{dx}((e^{(\ln a)}x))$ $= e^{(\ln a)}x \cdot \frac{d}{dx}((\ln a)x)$ $= \left(e^{(\ln \alpha)} \right)^{x} \cdot \ln \alpha = \left[\alpha^{x} \ln \alpha \right]$