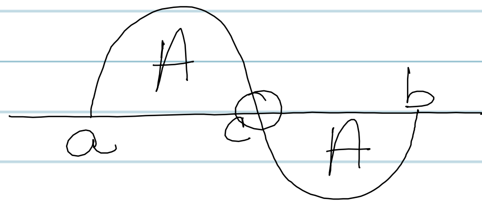
# $\boxed{\text{7.2 Section}}$ Areas under & between Curves

Ex:



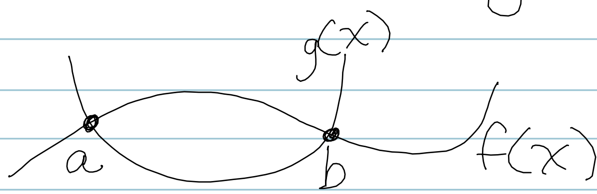

$$\int_a^b f(x)\,dx = 0$$

Integral accounts for negatives & positives

$$\int_a^c f(x)\,dx + \int_c^b f(x)\,dx = 2 * A \text{ or } 2A$$

1st need to set up a graph

Ex:




Area between f & g

$= \int_a^b \text{top curve} - \text{bottom curve}$ *Remember*

$$= \int_a^b f(x) - g(x)\,dx$$

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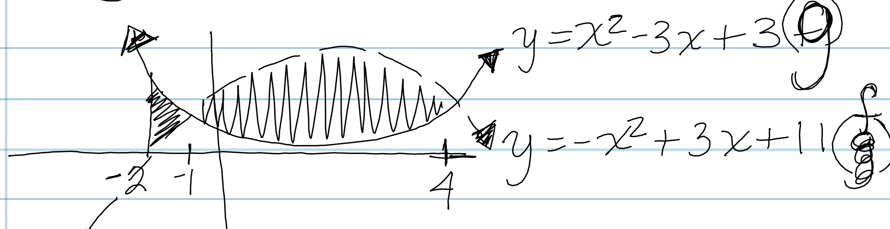


$$A = \int_{-2}^{-1} g - f\,dx + \int_{-1}^{4} f - g\,dx$$

b/c looking for total area being covered.

$\boxed{\text{Step 1}}$ $A = \underbrace{\int_{-2}^{-1} g - f\,dx}_{1} + \underbrace{\int_{-1}^{4} f - g\,dx}_{2}$

; so $\int_{-2}^{-1} (x^2-3x+3)-(-x^2+3x+11)\,dx$

$= \int_{-2}^{-1} (x^2-3x+3+x^2-3x-11)\,dx$

$= \int_{-2}^{-1} (2x^2-6x-8)\,dx \quad = \int_{-2}^{-1} \left(\frac{2x^3}{3}-\frac{6x^2}{2}-8x\right)\Big|_{-2}^{-1}$

$\boxed{\text{Step 2}}$ Use calculator to get actual # $= 5.6\overline{66}$ or $= \boxed{5\,2/3}$

$\boxed{\text{Step 3}}$ $\int_{-1}^{4} (-x^2+3x+11)-(x^2-3x+3)\,dx$

$= \int_{-1}^{4} (-x^2+3x+11-x^2+3x-3)\,dx$

$= \int_{-1}^{4} (-2x^2+6x+8)\,dx$, so $-\frac{2x^3}{3}+\frac{6x^2}{2}+8x\Big|_{-1}^{4}$

$\boxed{\text{Step 4}}$ Use calculator to get actual #
$= 41.666$ or $41\,2/3$

$\boxed{\text{Step 5}}$ Combine $5\,2/3 + 41\,2/3 = 46\,4/3$ or $\boxed{47\,1/3}$

*If you get an error = check window settings.

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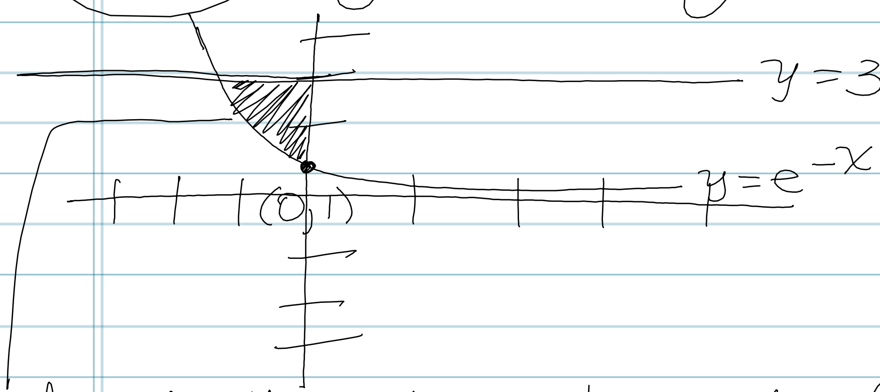
Enclosed by:
$y=e^{-x}$, $y=3$, and y-axis

Step 1




Looking for this piece b/c enclosed @ y-axis, so we only have 1 part

Step 2 $A=\int(3-e^{-x})dx$ Find where $(y=3)=(y=e^{-x})$, so where $3=e^{-x}$.

Step 3 $$\frac{\ln 3}{-1}=\frac{\cancel{\ln e}^{-x}}{-1}$$

$$\boxed{-\ln 3 = x}$$

$$\int_{-\ln 3}^{0}(3-e^{-x})\,dx = 3x \overset{+}{-}e^{-x} = 3x+e^{-x}$$

$$=\int_{-\ln 3}^{0}, \text{ so } 3x+e^{-x}\Big|_{-\ln 3}^{0}$$

$$=(3(0)+e^{-0})-(3(-\ln 3)+e^{-(-\ln 3)}) = 1-(-3\ln 3+3)$$

$$= 1+3\ln 3-3 = \boxed{-2+3\ln 3} \text{ or } \approx 1.2958369$$