Tecnológico de Monterrey Preparatoria

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Activity 4.3: Area between two curves

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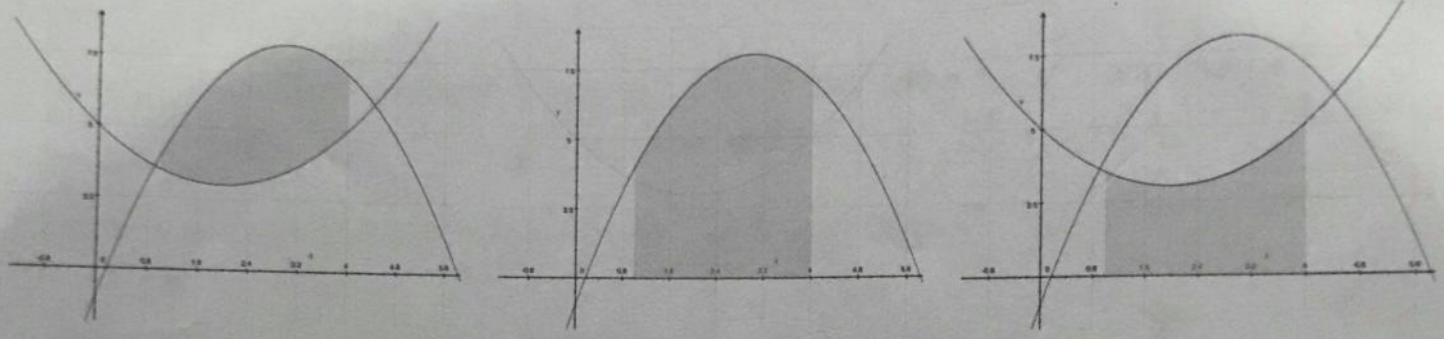
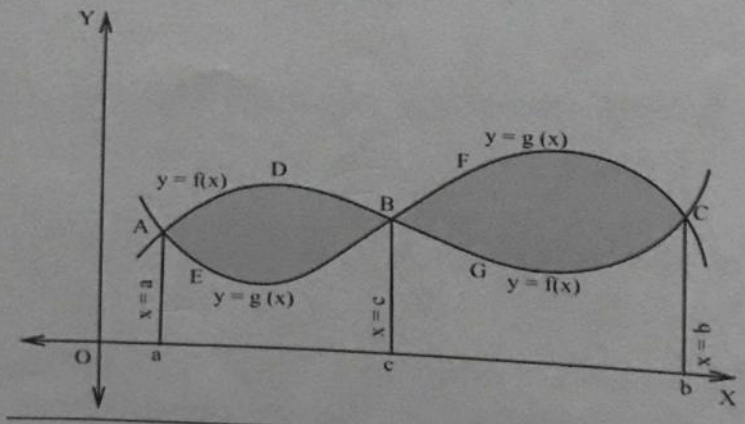


Area between two graphs	=	Area below f(x)	−	Area below g(x)
$\int_a^b [f(x)-g(x)]dx$		$\int_a^b f(x)dx$		$\int_a^b g(x)dx$



Source: http://silverbullet.in/chapters/lessonsummary/3442/3250 , retrieved on July 1st, 2016

$$A_1 = \int_a^c [f(x)-g(x)]dx \qquad A_2 = \int_c^b [g(x)-f(x)]dx$$

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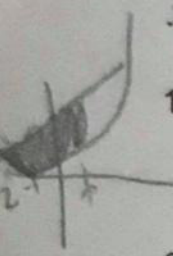
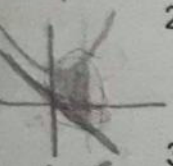
Determine the area between the two given functions, limited by the given vertical lines $x = a$ and $x = b$. REMEMBER to graph!

1. Determine the area limited by curves $g(x) = \frac{1}{2}x + 4$, and f(x) = x^2 + 2x + 1, and lines x = – 2 and x = 1



$\int_{-2}^{1} \frac{1}{2}x + 4 - x^2 - 2x - 1\,dx = \int_{-2}^{1} -x^2 - \frac{3}{2}x + 3\,dx = \frac{-x^3}{3} - \frac{3}{4}x^2 + 3x\Big|_{-2}^{1} =$ **8.25 u²**

2. Determine the area limited by the curves g(x) = – x and f(x) = x^2 + 2, and lines x = 0 and x = 1



$\int_{0}^{1} x^2 + 2 + x\,dx = A = \frac{x^3}{3} + \frac{2x^2}{2} + 2x + C\Big|_{0}^{1} =$ **2.83 u²**

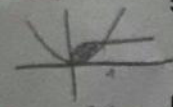
3. Determine the area limited by curves g(x) = 2 + x and f(x) = 1 – x^2, and lines x = 0 and x = 1

$\int_{0}^{1} 2 + x - 1 + x^2\,dx = \int_{0}^{1} x^2 + x + 1\,dx = A = \frac{x^3}{3} + \frac{x^2}{2} + x + C\Big|_{0}^{1} =$ **1.83 u²**

4. Determine the area limited by curves g(x) = x +2 and f(x) = x^2

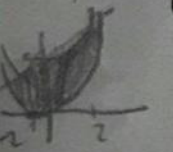
$\int_{-1}^{2} x + 2 - x^2\,dx = A = \frac{x^2}{2} + 2x - \frac{x^3}{3} + C\Big|_{-1}^{2} =$ **4.5 u²**

5. Determine the area limited by the curves g(x) = x^2 and f(x) = $\sqrt{x}$



$\int_{0}^{1} x^{\frac{1}{2}} - x^2\,dx = A = \frac{2x^{\frac{3}{2}}}{3} - \frac{x^3}{3} + C\Big|_{0}^{1} =$ **1/3 u²**

6. Determine the area limited by the curves g(x) = 2x + 5 and f(x) = x^2 + 2x + 1, and lines x = – 2 and x = 2



$\int 2x + 5 - x^2 - 2x - 1\,dx = A = \int -x^2 + 4\,dx = A = \frac{-x^3}{3} + 4x\Big|_{-2}^{2} =$ **10.67 u²**

7. Determine the area limited by the curves g(x) = sin(x) and f(x) = cos(x), and lines x = $\pi/4$ and x = $5\pi/4$

$\int_{\frac{\pi}{4}}^{\frac{5\pi}{4}} \sin(x) - \cos(x)\,dx = A = -\cos(x) - \sin(x) + C\Big|_{\frac{\pi}{4}}^{\frac{5\pi}{4}} = A =$ **2.83 u²**

8. Determine the area limited by the curves g(x) = ½ x +2 and f(x) = x^2, and lines x = – 1 and x = 1

$\int_{-1}^{1} \frac{1}{2}x + 2 - x^2\,dx = A = \frac{x^2}{4} + 2x - \frac{x^3}{3} + C\Big|_{-1}^{1} =$ **3.333 u²**

9. Determine the area of the region between the graphs of graphs f(x) = $3x^3$ – x^2 – 10x and g(x) = – x^2 + 2x

$\int_{-2}^{0} 3x^3 - x^2 - 10x + x^2 + 2x\,dx = A = \int_{-2}^{0} 3x^3 - 12x = A = \frac{3x^4}{4} - 6x^2\Big|_{-2}^{0} = 12$

$\int_{0}^{2} = -x^2 + 2x - 3x^3 + x^2 + 10x = -3x^3 + 10x = A = \frac{-3x^4}{4} + 6x^2\Big|_{0}^{2} = 12$

24 u²

10. Determine the area limited by curves $g(x) = e^{x/2} + 2$ and f(x) = 3 – 2x, and lines x = – 1 and x = 1

$\int 3 - 2x - e^{\frac{x}{2}} + 2 = A = 3x - x^2 - 2e^{\frac{x}{2}} + C\Big|_{-1}^{0} =$ **1.21 u²**

$\int_{0}^{1} e^{\frac{x}{2}} + 2 - 3 + 2x = A = 2e^{\frac{x}{2}} - x + x^2 + C\Big|_{0}^{1} =$ **1.297 u²**

2.507 u²

Additional practice:
http://cdn.kutasoftware.com/Worksheets/Calc/07%20-%20Area%20Between%20Curves.pdf

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