(10) $v(t) = (t-2)\sin t$

$0 \le t \le 4$

(a) $\int_0^4 (t-2)\sin t\,dt$

(b) $\int_0^4 \left|(t-2)\sin t\right| dt$

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(11)

$h = -\frac{1}{2}gt^2 + v_0 t$

$p = h = -16t^2 + 90t$

a. $v = -32t + 90$

$= -6$ ft/sec

b. $0 = -16t^2 + 90t$

$0 = -2t(8x - 45)$

0 $\quad$ $\frac{45}{8} = 5.625$

c. $\int_0^{5.625} (-32t + 90)\,dt$

d. $\int_0^{5.625} |-32t + 90|\,dt$

7-2 Areas in the Plane

Learning Target:

I can find the area between two curves.

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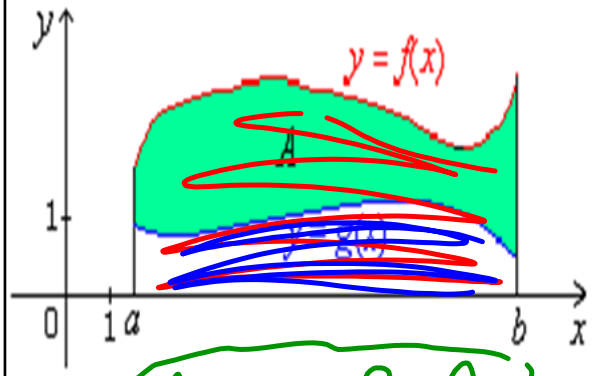
Area under f(x)



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

Area under g(x)

$\int_a^b g(x)\,dx$

Area of A

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

Area between f(x) and g(x

Area Between Curves

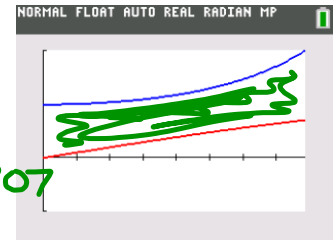
If f and g are connuous with $f(x) \geq g(x)$ throughout [a,b], then the area between the curves y=f(x) and y=g (x) from a to b is

$$A = \int_a^b [f(x) - g(x)]dx$$

Example 1: Find the area of the region betwee

$y = \sec^2 x$ and $y = \sin x$ from $x = 0$ to $x = \frac{\pi}{4}$

$y = \left(\frac{1}{\cos x}\right)^2$



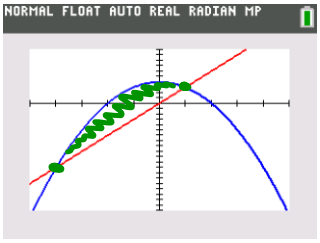
$\int_0^{\pi/4} \left(\left(\frac{1}{\cos x}\right)^2 - \sin x\right) dx = .707$

$(\tan x + \cos x)\Big|_0^{\pi/4} = \tan\frac{\pi}{4} + \cos\frac{\pi}{4} - \tan 0 - \cos 0$

$= 1 + \frac{\sqrt{2}}{2} - 0 - 1$

$= \frac{\sqrt{2}}{2}$

Example 2: Find the area of the region enclosed by $f(x) = 4 - x^2$ and $g(x) = 3x$



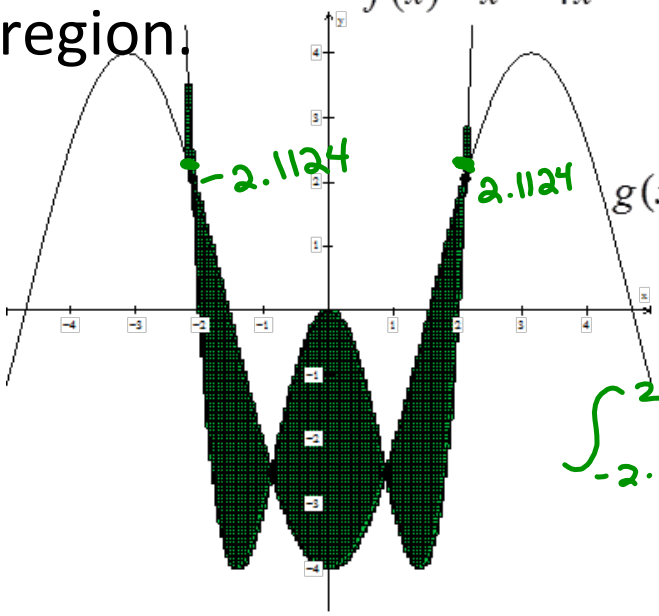
$$\int_{-4}^{1} |4 - x^2 - 3x| \, dx$$

$$= 20.833$$

$$\left(4x - \frac{1}{3}x^3 - \frac{3}{2}x^2\right)\Big|_{-4}^{1}$$

Example 3: Find the area of the shaded region.

$f(x) = x^4 - 4x^2$



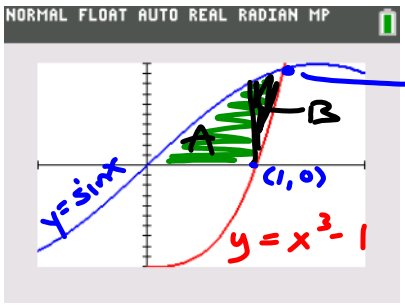
$g(x) = 4\sin\left(x - \frac{\pi}{2}\right)$

$$\int_{-2.1124}^{2.1124} \left| 4\sin\left(x - \frac{\pi}{2}\right) - x^4 + 4x^2 \right| dx$$

$$= 10.577$$

Example 4: Find the area in the first quadrant that is bounded by the funcons $f(x) = \sin x$

and $g(x) = x^3 - 1$



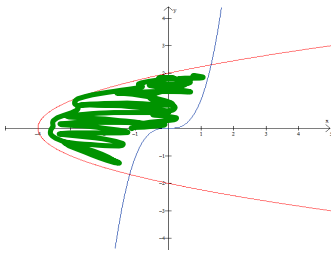
1.24905

A + B

$\int_0^1 \sin x\,dx + \int_1^{1.24905} (\sin x - (x^3 - 1))\,dx = .574$

.4597 + .1146

Example 5: Find the area of the region enclosed by the graphs of $y = x^3$ and $x = y^2 + \sin y - 4$



$x = \sqrt[3]{y}$ $\sqrt[3]{y} = y^2 + \sin y - 4$

$$\int_{-1.92235}^{2.10211} \left| \sqrt[3]{y} - (y^2 + \sin y - 4) \right| dy$$

$= 10.698$ units^2

$y = x^2 + \sin x - 4$

$y = \sqrt[3]{x}$

Homework

p. 395 #1-10, 13, 18, 20, 24, 28, 35, 37, 39, 50-55

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