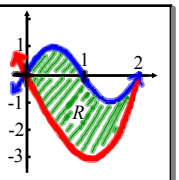
AP Test Question 2008
Part A - With Calculator

1) Let R be the region bounded by the graphs of $y = \sin(\pi x)$ and $y = x^3 - 4x$, as shown in the figure.



a) Find the area of R. **4 units^2**

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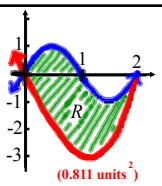

b) The horizontal line $y = -2$ splits the region R into two parts. Write, but do not evaluate, an integral expression for the area of the part of R that is below this horizontal line.

(0.811 units^2)

$$-\int_{0.539}^{1.675}[x^3 - 4x - (-2)]dx \quad \text{or} \quad \int_{1.675}^{0.539}[x^3 - 4x - (-2)]dx$$

or $\left|\int_{0.539}^{1.675}[x^3 - 4x - (-2)]dx\right|$

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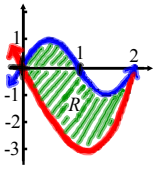

c) The region R is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a square. Find the volume of this solid.

9.978 units^3

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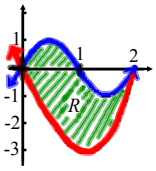

d) The region R models the surface of a small pond. At all points in R at a distance x from the y-axis, the depth of the water is give by $h(x) = 3 - x$. Find the volume of water in the pond.

8.370 units^3