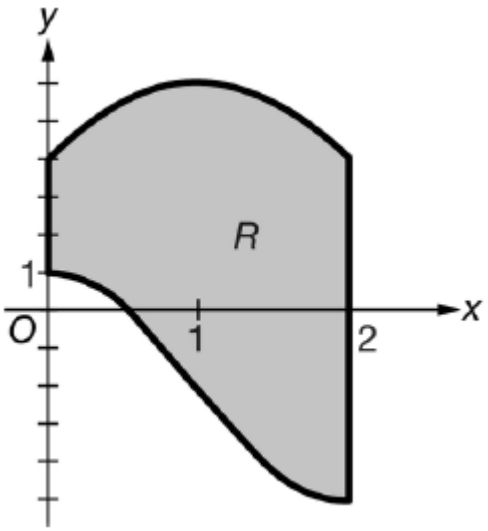
Name_____ BC Unit 1 Free Response

No Calculator

1. Let R be the region enclosed by the graphs of $g(x) = -2 + 3\cos\left(\frac{\pi}{2}x\right)$ and $h(x) = 6 - 2(x-1)^2$, the y-axis, and the vertical line $x = 2$ as shown in the figure.



a) Find the area of R. All algebraic work must be shown.

b) Region R is the base of a solid. For the solid, at each x the cross section perpendicular to the x-axis has area $A(x) = \frac{1}{x+3}$. Find the volume of the solid.

c) Write, but do not evaluate, an integral expression that gives the volume of the solid generated when R is rotated about the y-axis.

d) Write, but do not evaluate, an integral expression that gives the arc length of $g(x)$ on the interval [0,2].

2. Let R be the region in the first quadrant under the graph of $y = \frac{8}{\sqrt[3]{x}}$ for $1 \leq x \leq 8$.

   a. Find the area of region R.

   b. The line $x = k$ divides the region R into two regions. If the part of region R to the left of the line is $\frac{5}{12}$ of the area of the whole region R, what is the value of k?

   c. Find the volume of the solid generated when R is revolved about the x-axis.