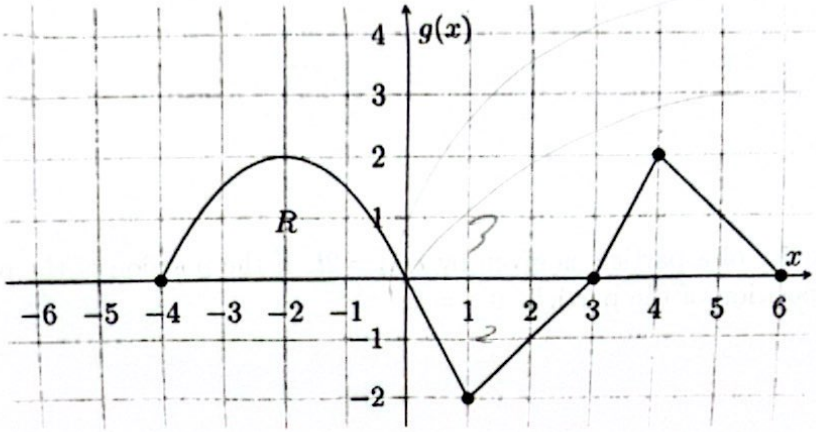
Big 10 Unit 8 Review

Instructions: In the box below are the numbers 0 – 9. Complete the following and cross off the number for each answer. If you complete all problems correctly, you will cross off each number exactly once!

0	1	2	3	4	5	6	7	8	9



Let g be the function whose graph is shown above. $g(x)$ is defined as $y = -\frac{1}{2}(x+2)^2 + 2$ on $-4 \le x \le 0$ and is piecewise linear from $x = 0$ to $x = 6$. Let R be the region enclosed by $g(x)$ and the x-axis from $x = -4$ to $x = 0$.

1. Find the area enclosed between the curves $y = 6\sqrt{x}$ and $y = 3x$.

2. The region R is the base of a solid. For this solid, the cross sections perpendicular to the x-axis are rectangles with height $\frac{1}{4}$. The volume of the solid can be expressed as the simplified fraction $\frac{a}{b}$. What is $a + b$?

3. Suppose the velocity of a particle can be modeled with $g(t) = v(t)$ where $t \ge 0$. What is the total distance traveled of the particle from $t = 0$ to $t = 6$?

4. The region R is the base of a solid. For this solid, the cross sections perpendicular to the x-axis are isosceles right triangles with a leg on the region R. The volume of the solid can be expressed as the simplified fraction $\frac{a}{b}$. What is $a - 4b$?

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5. What is the average value of $f(x) = x^3 - 1$ on the interval $[1, 3]$?

$\frac{1}{2}\int_1^3 x^3 - 1 \, dx$ $\frac{x^4}{4} - x$ $\frac{81}{4} - 3$ (9)

$\frac{80}{4} + \frac{3}{4}$ $\frac{72}{4} - \frac{18}{2} = 9$

6. A tank of water fills at a constant rate of 16 gallons per hour. The water tank leaks water at a rate $D(t) = t^2 + 7$ gallons per hour. At what time is the amount of water in the tank a maximum on the interval $[0, 10]$?

16 $9 = t^2$ (3)

3

7. Suppose the velocity of a particle is given by $v(t) = 2t$. If the position of the particle $x(t)$ is -3 at $t = 1$, what is the position of the particle at $t = 2$?

$\int_1^2 2t$ t^2 $4 - 1 = 3$ $= 16 -$ $-3 + 3 = 0$

8. The rate at which lava erupts from a volcano and lands on the ground is given by $L(t) = t^2 + \frac{1}{6}$ where $L(t)$ is measured in cubic kilometers per second and t is measured in seconds. If there is 2.5 cubic kilometers of lava on the ground at $t = 1$ second, how much lava is on the ground $t = 2$ seconds?

(5) $2.5 + \int_1^2 t^2 + \frac{1}{6}$ $\frac{8}{3} + \frac{1}{3}$ $\frac{9}{3} - 3 - \frac{1}{2}$

$\frac{8}{3} + \frac{1}{6} \times$ $\frac{1}{3} + \frac{1}{6}$ 2.5

9. If $m(x) = 9x$ and $n(x) = 3x^2 + 3x$. What is the average vertical distance between $m(x)$ and $n(x)$ on the interval $[0, 2]$?

(2) $\frac{1}{2}\int_0^2 3x^2 + 3x - 9x$ $x^3 + \frac{3x^2}{2}$ -4

$3x^2 - 6x$ $x^3 - 3x^2$

$8 - 12$

10. Let S be the region enclosed by the curves $x = 1$ and $x = y^2$. The volume of the solid generated when S is rotated about the vertical line $x = 1$ can be expressed as the simplified fraction $\frac{a\pi}{b}$. What is $a - b$?

(1) $\pi \int_0^1 (1 - y^2)^2 \, dy$ $1 - 2y^2 + y^4$

$1 - \frac{2}{3}y^3 + \frac{y^5}{5}$

$1 - \frac{1}{5} + \frac{2}{3}$ $\frac{3}{15}$ $\frac{10}{15}$ $\frac{13}{15}$ $\frac{2}{15}$