This exam covers chapters 6.1 - 6.5.

Directions: Complete all question and **show all applicable work.** Partial credit will be given.

1.) Find the arc length of the function $f(x) = \frac{2}{3}x^{\frac{3}{2}}$ on the domain $x \in [0, 2]$.

2.) Find the average value of the function $f(x) = \sqrt{x}$ on the domain $x \in [0, 2]$.

3.) Find the **area** enclosed between $f(x) = x^2$ and $g(x) = x$.

4.) Using the disk method, find the **volume** formed by rotating the area enclosed by the x-axis, $x = 1$, $x = 2$ and $y = \sqrt{x}$ about the x-axis.

5.) Using the cylindrical shell method, Find the **volume** formed by rotating the area enclosed by the x-axis, $x = 1$, $x = 2$ and $y = \sqrt{x} - 1$ about the y-axis.

6.) A microphone converts sound waves into an electrical signal. If the electrical signal generated is given a equation $s(t) = \sin(t) + 2.5$, what is the average value of the signal during the first 6π seconds of the recording?

7.) Let $f(x) = x^3$ and $g(x) = 2x - x^2$ and assume $x \geq 0$.

(a) Create a graph of $f(x)$ and $g(x)$. Be sure to label the intersection points.

(b) Find the area of the region enclosed between $f(x)$ and $g(x)$.

(c) Find the volume obtained by rotating the enclosed region of $f(x)$ and $g(x)$ about the x-axis.

(d) Find the volume obtained by rotating the enclosed region of $f(x)$ and $g(x)$ about the y-axis.

8.) A race car's position on a track is given by the equations $x(t) = 3\sin(t)$ and $y(t) = 4\sin(t)$, where t is the time from the beginning of the race in hours, and x and y is the distance from a central point in kilometers. How far does the car travel during the half hour of the race?