1. Assume that water is poured into a spherical fish bowl at a constant rate. Construct a graph that represents the height of water in the spherical bowl as a function of the amount of water in the bowl. (10 pts.)

![Spherical fish bowl with graph]

i) Explain the reasoning you used to construct your graph.

2. a. A spherical balloon with radius \( r \) inches has volume \( V(r) = \frac{4}{3} \pi r^3 \). Find a function that represents the average rate of change of the balloon as it inflates from a radius of \( r \) inches to \( r + 2 \) inches. (Show Work!)

\[
V(r + 2) = \frac{4}{3} \pi (r + 2)^3
\]

avg rate of change = \[
\frac{\frac{4}{3} \pi (r + 2)^3 - \frac{4}{3} \pi r^3}{2}
\]

\[
= \frac{V(r + 2) - V(r)}{(r + 2) - r}
\]

b. Find the average rate of change of the balloon as it inflates from 2 inches to 5 inches. (Show Work!)

\[
\frac{V(5) - V(2)}{5 - 2} = \frac{\frac{4}{3} \pi (5)^3 - \frac{4}{3} \pi (2)^3}{5 - 2}
\]

\[
= \frac{\frac{4}{3} \cdot 125 \pi - \frac{4}{3} \cdot 8 \pi}{3}
\]

\[
= \frac{52 \pi}{3}
\]

\[
\approx 163.6 \quad \text{( correct)} = 52 \pi
\]