Please turn in your work on the paper provided. There are two problems, so please turn the page over for problem 2.

1. (10 pts.) Find the area of the surface generated by revolving the curve \( x = 2\sqrt{4-y} \) for \( 0 \leq y \leq 15/4 \) about the \( y \)-axis.

\[
\begin{align*}
X &= 2\sqrt{4-y} \quad 0 \leq y \leq 15/4 \\
\frac{dx}{dy} &= \frac{-2}{\sqrt{4-y}} = \frac{-1}{\sqrt{4-y}} \\
(1 + \frac{dx}{dy})^2 &= 1 + \frac{1}{4-y} \\
\sqrt{1 + \frac{dx}{dy}^2} &= \sqrt{\frac{4-y}{4-y}} \\
S &= \int_0^{15/4} 2\pi 2\sqrt{4-y} \sqrt{4-y} \ dy \\
&= 4\pi \int_0^{15/4} (4-y) \ dy \\
&= -4\pi \left[ \frac{3}{2} (5\sqrt{5} - 5\sqrt{5}) \right] \\
&= \frac{8\pi}{3} \left( 35\sqrt{5} - 5\sqrt{5} \right) \\
&= \frac{8\pi}{3} \left( 30\sqrt{5} \right) \\
&= \frac{3}{3} \left( 30\sqrt{5} \right)
\end{align*}
\]
2. Consider a box shaped tank with a rectangular base of dimensions 12 ft x 10 ft. The top of the tank is at ground level and then it goes underground for 20 ft. The tank is used to catch runoff water. Assume water weighs 62.4 lb/ft$^3$.

(a) How much work does it take to empty the tank by pumping the water back to ground level once the tank is full?

(b) Assume now the tank is in a location where water weighs 62.26 lb/ft$^3$. What is now the answer to part (a)?

\[ \Delta V = (10)(12) \Delta y \text{ ft}^3 \]

\[ F_x = 62.4 \Delta V \text{ lb} \]

\[ \Delta W = F_x \gamma \text{ ft-lb} \]

\[ W = \int_0^{20} 62.4(120) y \, dy \]

\[ = 62.4(120) \left[ \frac{y^2}{2} \right]_0^{20} \]

\[ = 62.4(120)(400) \text{ ft-lb} \]

\[ b) \ 62.26(120)(400) \text{ ft-lb}. \]