

Instructions: Show all work. Answers without work required to obtain the solution will not receive full credit. Some questions may contain multiple parts: be sure to answer all of them. Give exact answers unless specifically asked to estimate.

1. A cable weighing 21 lbs/ft is used to lift 800 lbs of coal up a mine shaft. Find the work done. ← 1000 feet deep

$$800 * 1000 + \int_0^{1000} 21 (1000 - x) dx$$

$$800,000 + 21 \int_0^{1000} 1000 - x dx =$$

$$800,000 + 21 \left[1000x - \frac{1}{2}x^2 \right]_0^{1000} =$$

$$800,000 + 21 \left[1,000,000 - \frac{1}{2}(1,000,000) \right] =$$

$$800,000 + 21 [500,000] = 11,300,000 \text{ ft-lbs}$$

2. Find the average value of the function $h(x) = \cos^4 x \sin x$. Use a graphing calculator to find a value c so that $f(c) = \bar{f}$.

$[0, \pi/2]$

$$\frac{2}{\pi} \int_0^{\pi/2} \cos^4 x \sin x dx = \frac{2}{\pi} \left[-\frac{1}{5} \cos^5 x \right]_0^{\pi/2}$$

$$= \frac{2}{\pi} \left[-\frac{1}{5}(0) + \frac{1}{5}(1) \right] = \frac{2}{5\pi}$$

$$c \approx .13225571$$

$$c \approx .87940664$$

