

Quiz #5

SOLUTION

{ 20 points } A boat is anchored so that the anchor is 100 ft below the surface of the water. In the water, the anchor weighs 1200 lb and the chain weighs 40 lb/ft. How much work is required to raise the anchor to the surface?

When the anchor is x ft below the surface the total weight is $1200 + 40x$ lb and therefore the force is $F(x) = (1200 + 40x)g$, where g is the gravity constant. Thus,

$$\begin{aligned} W &= \int_0^{100} F(x) dx = \int_0^{100} (1200 + 40x)g dx = (20x^2 + 1200x)g \Big|_0^{100} \\ &= (200,000 + 120,000)g = 320,000g \end{aligned}$$