AP Calculus BC
Lesson 6.4 Work

6.4(1)

1. How much work must be done to lift a 70-lb weight to a height of 5 ft?

2. How much work must be done to lift a rock of mass 6 kg a distance of 3 m? The acceleration due to gravity is 9.81 m/sec^2.

6.4(2)

A particle is moving along the x-axis under the action of a force of $f(x)$ pounds when the particle is x feet from the origin. If $f(x) = x^2 + 4$, find the work done as the particle moves from the point where $x = 1$ to the point where $x = 5$.

6.4(3)

A spring has a natural length of 14 cm. If a force of 500 dynes is required to keep the spring stretched 2 cm, how much work is done in stretching the spring from its natural length to a length of 18 cm?

6.4(4)

A water tank in the form of an inverted right-circular cone is 2 m across the top and 1.5 m deep. If the surface of the water is 0.5 m below the top of the tank, find the work done in pumping the water to the top of the tank. Note: the weight density of water is 9810 N/m^3.

6.4(5)

As a water tank is being raised, water spills out at a constant rate of 2 ft^3 per foot of rise. If the weight of the tank is 200 lb and it originally contains 1000 ft^3 of water, find the work done in raising the tank 20 ft. Note: the weight density of water is 62.5 lb/ft^3.

6.4(6)

A chain 15 ft long and weighing 3 lb/ft is hanging vertically from the top of a building. Find the work required to raise 10 ft of the chain to the level of the top of the building so that 5 ft remain hanging.

6.4(7)

A storage tank in the shape of an inverted right-circular cone has a radius of 4 m and a height of 8 m. It is filled to a height of 6 m with olive oil (density = 920 kg/m^3). To bottle the oil, the bottler must first pump it to the top of the tank. How much work is done in accomplishing this task?

6.4(8)

A swimming pool is 40 ft long and 20 ft wide. The floor of the pool has a constant slope from a depth of 2 ft at one end to a depth of 10 ft at the other. Find the work required to pump all the water out through a valve at the top edge of the pool when the pool is full.