

# LSN# 13 Answers

MA205 Integral Calculus and Introduction to Differential Equations

## Mechanics Based Problems

1. A particle is moved along the  $x$ -axis by a force that measures  $\frac{10}{(1+2x)^2}$  pounds at a point  $x$  feet from the origin. Find the work done in moving the particle from the origin to a distance of 9 ft.

$$W \approx 4.736 \text{ ft}\cdot\text{lbs}$$

ANS

2. When a particle is located at a distance  $x$  meters from the origin, a force of  $\cos(\pi x/3)$  Newtons acts on it. How much work is done in moving the particle from  $x = 1$  to  $x = 2$ ? Interpret your answer by considering the work done from  $x = 1$  to  $x = 1.5$  and from  $x = 1.5$  to  $x = 2$ .

$$W = \underline{\underline{\phi}}$$

$$W_{1-1.5} = 0.1279$$

$$W_{1.5-2} = -0.1279$$

Problem Solving Problems

1. The table below shows the values of a force function  $f(x)$ , where  $x$  is measured in meters and  $f(x)$  is measured in Newtons. Use the Midpoint rule to estimate the work done by the force in moving an object from  $x = 4$  to  $x = 20$ ?

$x$	4	6	8	10	12	14	16	18	20
$f(x)$	5	5.8	7	8.8	9.6	8.2	6.7	5.2	4.1

$$W = 112 \text{ N}\cdot\text{m} \text{ (J)}$$

ANS.

\* Because this is an estimation, there are other possible answers.

2. A uniform cable hanging over the edge of a tall building is 40 ft long and weighs 60 lbs. How much work is required to pull 10 ft of the cable to the top?

$$W = 525 \text{ ft}\cdot\text{lbs}$$

ANS

3. A cable that weighs 2 lb/ft is used to lift 800 lbs of coal up a mine shaft 500 ft deep. Find the work done.

$$W = 650,000 \text{ ft} \cdot \text{lbs}$$

ANS

4. A chain lying on the ground is 10 m long and its mass is 80 kg. How much work is required to raise one end of the chain to a height of 6 m?

$$W = 1411.2 \text{ J}$$

ANS