**Chapter 2**

**Applications of Integration**

**2.5 Physical Applications**

**Section Exercises**

**For the following exercises, find the work done.**

219. How much work is done when a person lifts a  lb box of comics onto a truck that is  ft off the ground?

Answer:150 ft-lb

221. Find the work done when you push a box along the floor  m, when you apply a constant force of .

Answer: 

223. What is the work done moving a particle from  to  m if the force acting on it is  N?

Answer: 1 J

**For the following exercises, find the mass of the one-dimensional object.**

225. A car antenna that is ft long (starting at ) and has a density function of  lb/ft

Answer:

227. A pencil that is in. long (starting at ) and has a density function of  oz/in.

Answer:

**For the following exercises, find the mass of the two-dimensional object that is centered at the origin.**

229. An oversized hockey puck of radius in. with density function 

Answer:

231. A plate of radius  in. with density function 

Answer: 

233. A disk of radius  cm with density function

Answer: 

235. A spring has a natural length of  cm. It takes  J to stretch the spring to  cm. How much work would it take to stretch the spring from  cm to  cm?

Answer: J

237. A spring requires J to stretch the spring from  cm to  cm, and an additional J to stretch the spring from  cm to  cm. What is the natural length of the spring?

Answer:cm

239. A force of N stretches a nonlinear spring by meters. What work is required to stretch the spring from  to  m?

Answer:J

241. For the cable in the preceding exercise, how much work is done to lift the cable  ft?

Answer:  ft-lb

243. **[T]** A pyramid of height  ft has a square base  ft by  ft. Find the area  at height. If the rock used to build the pyramid weighs approximately , how much work did it take to lift all the rock?

Answer:

245. **[T]** The force of gravity on a mass  is  newtons. For a rocket of mass , compute the work to lift the rocket from  to km. (Note:  and )

Answer:

247. **[T]** A rectangular dam is  ft high and  ft wide. Compute the total force  on the dam when

1. the surface of the water is at the top of the dam and
2. the surface of the water is halfway down the dam.

Answer a. lb, b.  lb

249. **[T]** Find the work required to pump all the water out of the cylinder in the preceding exercise if the cylinder is only half full.

Answer: million ft-lb

251. A cylinder of depth  and cross-sectional area  stands full of water at density Compute the work to pump all the water to the top.

Answer: 

253. A cone-shaped tank has a cross-sectional area that increases with its depth:  Show that the work to empty it is half the work for a cylinder with the same height and base.

Answer: Answers may vary.

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