

Work, Energy and Power

Objective : Calculation of work done in a body by a single force (using dot product) and work done by different forces acting on a body simultaneously.

Note : Value of acceleration due to gravity may approximated as 10 ms^{-2} .

1. A body undergoes a displacement of 10 m in the direction of a force of 20N applied on it. Find the work done by the force.
2. A body of mass 5 kg is subjected to a force due to which velocity of a body changes from 10 ms^{-1} to 30 ms^{-1} in 10 seconds. Find the work done by the applied force on the body.
3. A force of 20N is applied on a body of mass 2kg for 10 seconds. Find the work done by the applied force.
4. A force of $2\hat{i} + 3\hat{j}$ N acts on a body causing a displacement of $4\hat{i} - 2\hat{j}$ m in it. Find the work done by the force.
5. A force of $5\hat{i} - 2\hat{j}$ N acts on a body and displaces it from an initial position of $-2\hat{i} - \hat{j}$ m to a final position of $6\hat{i} - 2\hat{j}$ m. Find the work done by the applied force.
6. A body of mass 40kg is pulled through a distance of 20m along a smooth horizontal surface as shown in the figure.

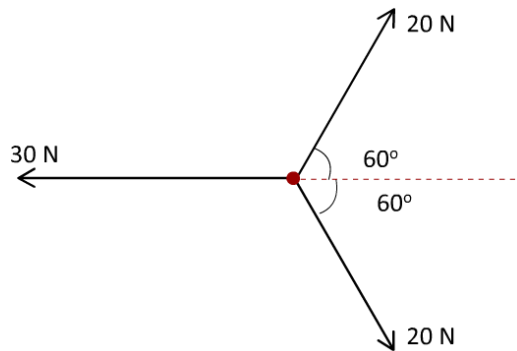


Find the work done on the body by

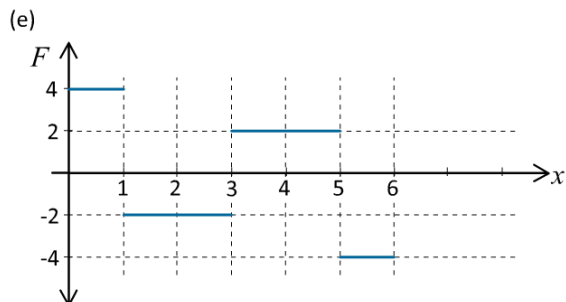
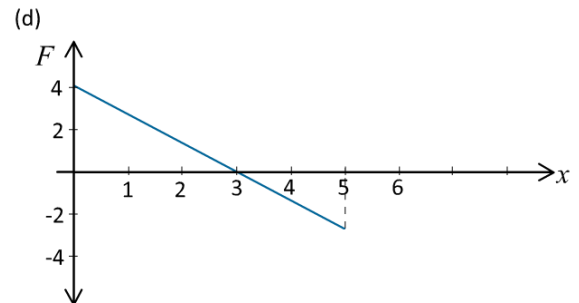
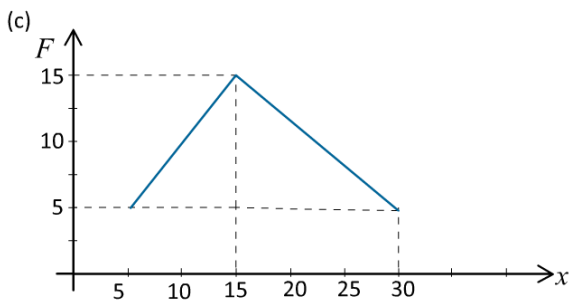
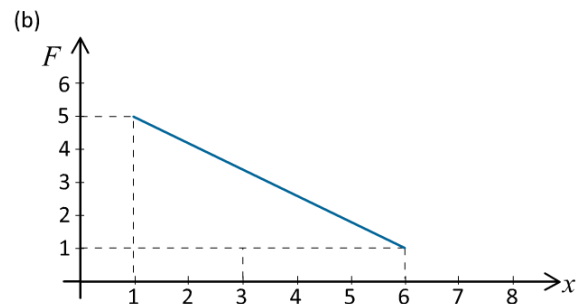
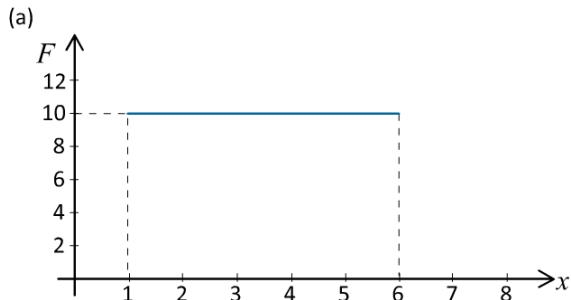
- (a) applied force
 - (b) normal reaction
 - (c) gravitational force
7. A body of mass 100 kg, initially at rest, is pulled on a rough horizontal ground by a force of 800N for 10 seconds. Coefficient of kinetic friction between the body and the ground is 0.4. Find work done by
 - (a) applied force
 - (b) Normal reaction
 - (c) gravitational force
 - (d) frictional force
 - (f) all the forces acting on the body
 8. A box of mass 10kg is lifted from ground to a height of 2m. Find the work done by
 - (a) applied force
 - (b) gravitational force

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9. Three forces (as shown in the figure below) act on a body of mass 5 kg, which is initially at rest. If the forces act for 5 seconds then find the work done by each force.



10. Work done by a force applied on a body is given by the area under the force-displacement graph. Calculate the work done in each of the cases given below.



Answers

1. 200 J
2. 2000 J
3. 10000 J
4. 2J
5. 42 J
6. 4000 J, zero, zero
7. 160000 J, zero, zero, 80000 J, 80000J
8. +200 J, -200 J
9. 750 J, 250 J, 250 J
10. 50 J, 15 J, 250 J, 4 J, zero

For detailed solutions mail your request to sigmaaprc@gmail.com (mention the class / chapter / assignment number in the mail)