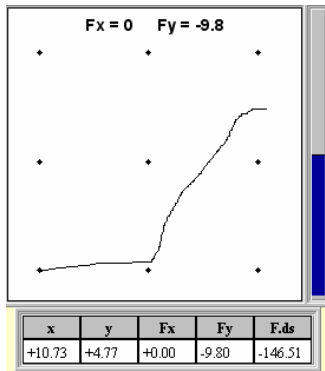


Worksheet for Exploration 6.6: Forces, Path Integrals, and Work



Move your cursor into the animation, then click-drag the crosshair cursor with the mouse. The bar graph on the right displays the work done by the force along the path. For your reference, there are circles every 10 m that form a coordinate grid (**position is given in meters and the result of the integral is given on the bar graph in joules**). Use the "reset integral" button to re-zero the work calculation between paths. [Restart](#).

For each force, answer the following questions:

For paths a through f place answers in the tables below.\

- Starting at the origin (the center, $x = 0$ m and $y = 0$ m) and moving to $x = 0$ m and $y = 10$ m, what is the work done by the force?
 - Starting at $x = 0$ m and $y = 10$ m and moving to $x = 0$ m and $y = 0$ m, what is the work done by the force?
 - Starting at the origin (the center, $x = 0$ m and $y = 0$ m) and moving to $x = 0$ m and $y = -10$ m, what is the work done by the force?
 - Starting at the origin (the center, $x = 0$ m and $y = 0$ m) and moving to $x = 10$ m and $y = 0$ m, what is the work done by the force?
 - Starting at the origin (the center, $x = 0$ m and $y = 0$ m) and moving to $x = -10$ m and $y = 0$ m, what is the work done by the force?
- a. Starting at the origin (the center, $x = 0$ m and $y = 0$ m), choosing your own path around the

For each path described in (a) through (f), measure the work done by the force using the animation.

| | $F_x = 0$ $F_y = -9.8$ | $F_x = 0$ $F_y = -x$ | $F_x = x$ $F_y = y$ | $F_x = y$ $F_y = y*x$ | $F_x = x*x/4$ $F_y = y*y/4$ |
|--------|---------------------------|-------------------------|------------------------|--------------------------|--------------------------------|
| Path a | | | | | |
| Path b | | | | | |
| Path c | | | | | |
| Path d | | | | | |
| Path e | | | | | |
| Path f | | | | | |

Additional Questions

For several examples in your table above (you select some) show how to calculate the work done by the force for a given path. Hint: break your calculation into integrals along x and along y.

i. Example 1.

ii. Example 2.

iii. Example 3.

iv. For each force determine if the work done by that force depends on a particular path or not. That is, select some points A and B (you pick) and decide if the work done to get from A to B is the same or different when you select a different path or route from A to B. Answer: Path Dependent or Path Independent.

| | | | | | |
|---------|---------------------------|-------------------------|------------------------|--------------------------|--------------------------------|
| | $F_x = 0$ $F_y = -9.8$ | $F_x = 0$ $F_y = -x$ | $F_x = x$ $F_y = y$ | $F_x = y$ $F_y = y*x$ | $F_x = x*x/4$ $F_y = y*y/4$ |
| Answer: | | | | | |