Announcements

- Homework 3 due on Monday night
- CompDay 3 on Monday! On rockets!
- Remote Physics Tea today at 3:15!
- Responses: `rembold-class.ddns.net`

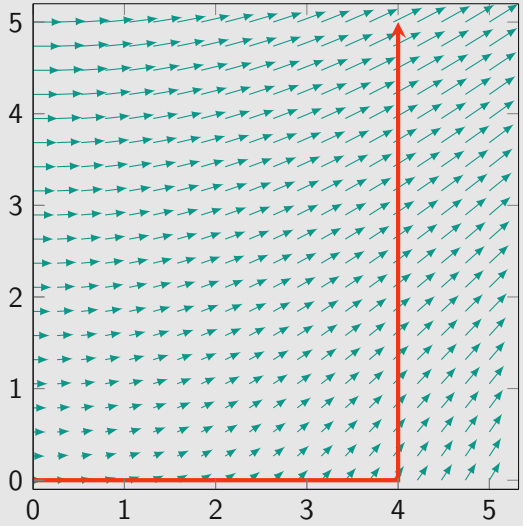
An Unprogressive Force

Today's Objectives

- Line integral practice
- Identify when forces are conservative
- Be able to calculate a potential due to a conservative force
- Interpret stability from potential energy curves

An Unprogressive Force

Q1



A force is given by:

$$F(x, y, z) = (y + 3)\hat{\boldsymbol{x}} + x\hat{\boldsymbol{y}}$$

Suppose a particle moves from the origin to the point (4,0) and then to the point (4,5). What is the work done by the force on the particle?

A) -42 J

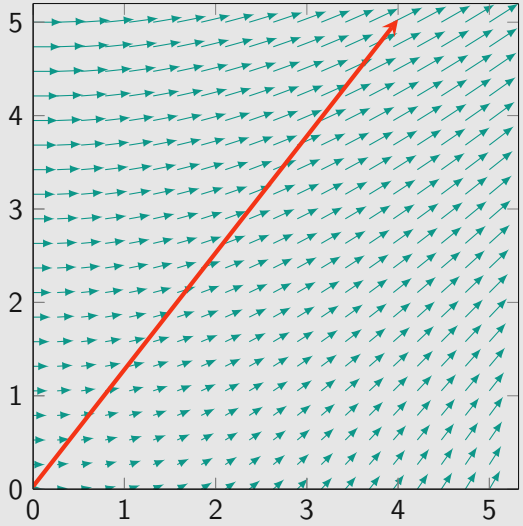
B) 32 J

C) 42 J

D) 150 J

An Unprogressive Force

Q2



Suppose I tell you that the work done along the path shown to the left is also equal to 32 J. Would you say that the force is a conservative one?

A) Yes!
B) No!
C) Maybe?
D) I'm lost...

Q3

I'll go ahead and tell you that

$$\vec{\boldsymbol{F}} = (y+3)\hat{\boldsymbol{x}} + x\hat{\boldsymbol{y}}$$

is indeed a conservative force. What expression below corresponds to its potential energy if the origin is taken as the zero-point?

A) $(10-x)y+2$

B) $-3xy$

C) $-xy-3x$

D) $x-y-3$

An Unprogressive Force

Q4

Only one of the below forces is conservative. Which one?

A) $\vec{\boldsymbol{F}} = (3t + x)\hat{\boldsymbol{x}} - (3t - y)\hat{\boldsymbol{y}}$

B) $\vec{\boldsymbol{F}} = 2x\hat{\boldsymbol{x}} - 3z\hat{\boldsymbol{y}} - 3y\hat{\boldsymbol{z}}$

C) $\vec{\boldsymbol{F}} = 3x\hat{\boldsymbol{x}} + 2z\hat{\boldsymbol{y}}$

D) $\vec{\boldsymbol{F}} = xy\hat{\boldsymbol{x}} + yz\hat{\boldsymbol{y}} + zx\hat{\boldsymbol{z}}$

An Unprogressive Force

Q5

Suppose an object is free to move in one dimension and has its potential energy given by:

$$U(x) = Ax^2 + (A - B)x^3$$

Under what conditions would the particle be stable at the point $x = 0$?

A) When $A > B$

B) When $A > 0$

C) The particle is not even in equilibrium at $x = 0$

D) This is an equilibrium point, but it will never be stable

An Unprogressive Force