

[gex64] Work done by conservative force II

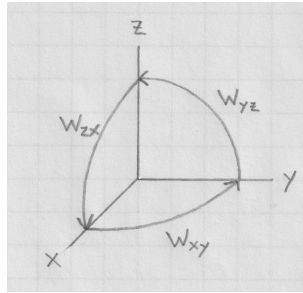
Consider the scalar field representing the potential energy of a particle:

$$U(\mathbf{x}) = -a(x+1)(y+1) - b(y+1)(z+1) - c(z+1)(x+1).$$

In this exercise, a, b, c are constants and coordinates are dimensionless.

(a) Calculate the (conservative) force $\mathbf{F}(\mathbf{x}) = -\nabla U(\mathbf{x})$ experienced by the particle.

(b) When the particle is moved quasi-statically along three quarter circles of unit radius between coordinate axes as shown, the force $\mathbf{F}(\mathbf{x})$ performs work W_{xy} , W_{yz} , and W_{zx} , in succession. Find W_{xy} , W_{yz} , W_{zx} and confirm that the sum vanishes as must be the case for a conservative force.



Solution: