

Math 233 - October 23, 2009

- How do you compute work when the vector field is a conservative field?

1. Let $r(t) = (t + 1, 2t - 4)$ for $-1 \leq t \leq 5$.

- (a) Find a parametrization for the reverse path $r^-(t) =$.
(If possible, try to make r and r^- have the same domain.)
- (b) Find the work done along r and r^- by the vector field $F = (x + y, x + 2y)$.

$$\int_r F \cdot dr =$$
$$\int_{r^-} F \cdot dr =$$

2. Let $r(t) = (t - 1, t + 1)$ for $-2 \leq t \leq 1$.

- (a) Find a parametrization for the reverse path $r^-(t) =$.
(If possible, try to make r and r^- have the same domain.)
- (b) Find the work done along r and r^- by the vector field $F = (x^2 - 1, xy)$.

$$\int_r F \cdot dr =$$
$$\int_{r^-} F \cdot dr =$$

3. Find potential functions for the following vector fields

- (a) $F_1 = (2x - yz + y^2, 2xy - xz, -xy)$
 $\phi_1 =$
- (b) $F_2 = (y, x + 2ye^z, y^2e^z)$
 $\phi_2 =$
- (c) $F_3 = (-2xz/(1 + x^2 + y^2)^2, -2yz/(1 + x^2 + y^2)^2, 1/(1 + x^2 + y^2))$
 $\phi_3 =$

Lecture Problems

4. Let $r(t) = (t^3 - t^2 + t, 2t^4 - 3t^3 + 1, 2 - t^2)$ for $-1 \leq t \leq 1$. Find the work done by the fields in Problem 1 over this curve.

- (a) $\int_r F_1 \cdot dr =$
- (b) $\int_r F_2 \cdot dr =$
- (c) $\int_r F_3 \cdot dr =$

5. True or false. What changes would you have to make to the false statements to make them true?
- (a) If the vector field F is conservative then the work done along any path only depends on the endpoints of that path.
 - (b) If the curl of the vector field F is $(0, 0, 0)$ then the work done along any path only depends on the endpoints of that path.
 - (c) If the work done by the vector field F around every loop is 0 then the vector field is conservative.
 - (d) If the work done by the vector field F along any path depends only on the end points of the path then the vector field is conservative.