9. (CONT.)

$$\int_C (x+y-z^2)\,ds$$

$$= \int_0^1 (3t)\sqrt{3^2+0^2+0^2}\,dt$$

$$= 9\int_0^1 t\,dt$$

$$= 9\left[\tfrac{1}{2}t^2\right]_0^1$$

$$= \tfrac{9}{2}\left[1^2-0^2\right]$$

$$= \frac{9}{2}$$

SEGMENT 1

$\vec{r}(t) = \underbrace{3t}_{x(t)}\vec{i} \qquad 0 \le t \le 1$

$f(x,y,z) = x+y-z^2$

$f(x(t),y(t),z(t)) = 3t + 0 - 0^2$

$= 3t$

$x'(t) = 3$

$y'(t) = 0$

$z'(t) = 0$

$$\int_C (x+y-z^2)\,ds$$

$$= \int_1^2 (-4t^2+8t-1)\sqrt{0^2+0^2+2^2}\,dt$$

$$= 2\left[-\tfrac{4}{3}t^3 + \tfrac{8}{2}t^2 - t\right]_1^2$$

$$= 2\left[\tfrac{-32}{3} + 16 - 2 - \left(\tfrac{-4}{3} + 4 - 1\right)\right]$$

$$= 2\left[\tfrac{-32}{3} + 14 + \tfrac{4}{3} - 3\right]$$

$$= 2\left[\tfrac{-28}{3} + 11\right]$$

$$= 2 \cdot \tfrac{5}{3}$$

$$= \tfrac{10}{3}$$

SEGMENT 2

$\vec{r}(t) = \underbrace{3}_{x(t)}\vec{i} + \underbrace{(2t-2)}_{z(t)}\vec{k} \qquad 1 \le t \le 2$

$f(x,y,z) = x+y-z^2$

$f(x(t),y(t),z(t)) = 3 + 0 - (2t-2)^2$

$= 3 - (2t-2)(2t-2)$

$= 3 - (4t^2-8t+4)$

$= -4t^2+8t-1$

$x'(t) = 0$

$y'(t) = 0$

$z'(t) = 2$