

$$6. \quad (0,0) \rightarrow (3,1)$$

$$x(t) = t$$

$$y(t) = \frac{1}{3}t$$

$$0 \leq t \leq 3$$

$$at+b=0$$

$$at+b=1$$

$$t=0$$

$$t=3$$

$$a(0)+b=0$$

$$3a+b=1$$

$$b=0$$

$$3a+0=1$$

$$a = \frac{1}{3}$$

Form:  $at+b$

$$\frac{1}{3}t$$

$$\int_C (3x^2 - y^2) ds$$

$$\vec{r}(t) = \underbrace{t}_{x(t)} \vec{i} + \underbrace{\frac{1}{3}t}_{y(t)} \vec{j}$$

$$0 \leq t \leq 3$$

$$f(x,y) = 3x^2 - y^2$$

$$f[x(t), y(t)] = 3t^2 - \left(\frac{1}{3}t\right)^2$$

$$= 3t^2 - \frac{1}{9}t^2$$

$$= \frac{27}{9}t^2 - \frac{1}{9}t^2$$

$$= \frac{26}{9}t^2$$

$$x'(t) = 1$$

$$y'(t) = \frac{1}{3}$$

$$\int_0^3 \frac{26}{9} t^2 \sqrt{1^2 + \left(\frac{1}{3}\right)^2} dt$$

$$= \frac{26}{9} \int_0^3 t^2 \sqrt{1 + \frac{1}{9}} dt$$

$$= \frac{26}{9} \int_0^3 t^2 \sqrt{\frac{10}{9}} dt$$

$$= \frac{26}{9} \cdot \frac{\sqrt{10}}{\sqrt{9}} \int_0^3 t^2 dt$$

$$= \frac{26\sqrt{10}}{27} \left[ \frac{1}{3} t^3 \right]_0^3$$

$$= \frac{26\sqrt{10}}{81} [3^3 - 0^3]$$

$$= \frac{26\sqrt{10}}{3}$$