Jessemo Bello   calc homework

16.2

3) $F = \langle y^2, x^2 \rangle$; C: $y = x^{-1}$ for $1 \le x \le 2$

from left to right

a) $F(r(t)) \cdot dr = r'(t)$ for $r(t) = \langle t, t^{-1} \rangle$

$x = t \quad y = t^{-1}$

$F(r(t)) = \langle t, t^{-1} \rangle \quad dr = \langle dt, -t^{-2} dt \rangle$

$F(r(t)) \cdot dr = (t^{-2} - 1)\, dt$

$\int_1^2 t^{-2} - 1\, dt = -1/2$

9) $F(x,y) = \sqrt{1 + 9xy} \quad y = x^3$ for $0 \le x \le 1$

$r(t) = \langle t, t^3 \rangle \to \|r'(t)\| = \sqrt{1 + 9t^4}$

$\int_0^1 \sqrt{1 + 9t^4} \cdot \sqrt{1 + 9t}\, dt = 2.8$ with Maple

11) $f(x,y,z) = z^2 \quad r(t) = \langle 2t, 3t, 4t \rangle \quad 0 \le t \le 2$

$x = 2t \quad y = 3t \quad z = 4t \quad f(r(t)) = 16t^2$

$ds = \|r'(t)\| dt = \sqrt{29}\, dt \to \int_0^2 16t^2 \sqrt{29}\, dt$

$= \dfrac{128\sqrt{29}}{3}$ with maple

13) $F(x,y,z) = xe^{z^2}$, point $(0,0,1)$ to $(0,2,0)$

$\int f(r(t))\, ds \quad \{ r(t) = \langle 0,0,1 \rangle + t\langle 0,2,0 \rangle = \langle 0, 2t, 1 \rangle$

$x = 0 \quad y = 2t \quad y' = 2\,dt \quad z = 1 \quad dz = 0$

$\int_0^1 \sqrt{3}\, t e^{t^2} dt = \sqrt{3}/2\, e^u \big|_0^1 = \dfrac{\sqrt{3}e}{2} - \dfrac{\sqrt{3}}{2} =$

$u = t^2 \to [0,1]$

$\frac{dy}{d} = t d^4$

17) $\int_C 1 \, ds$: $r(t) = \langle 4t, -3t, 12t \rangle$ $t = 2$ and $t = 5$

$\|r'(t)\| = \sqrt{4^2 + 3^2 + 12^2}$

$\int_2^5 1 \cdot 13 \, dt = 39$ the integral represents the distance between the points $(8, -6, 24)$ and $(20, 40, 60)$

27) $\int_C y\,dx - x\,dy$ parabola $y = x^2$ for $0 \le x \le 2$

$r(t) = \langle t, t^2 \rangle$

$x = t$ $y = t^2$ $dx = dt$ $dy = 2t\,dt$

$\int_0^2 t^2 dt - t(2t\,dt) = -8/3$

29 $\int_C (x-y)\,dx + (y-z)\,dy + z\,dz$

line segment $(0,0,0)$ to $(1,4,4)$

$r(t) = t\langle 1, 4, 4 \rangle = \langle 1, 4t, 4t \rangle$

$x = t$ $dx = dt$ $y = 4dt$ are marsll

31 $\int_C \frac{-y\,dx + x\,dy}{x^2 + y^2}$ line segment $(0,0,0)$ to $(1,4,4)$

$r(t) = t\langle 1, 4, 4 \rangle = \langle t, 4t, 4t \rangle$

$x = t$ $dx = dt$ $y = 4t$ $dy = 4dt$ $z = 4t$

2)) $\int_{PA} F(x,y,z)\,ds + \int_{AB} F(x,y,z)\,ds$ &

$\int_{BO} F(x,y,z)\,ds \quad F(x,y,z) = e^{z}, e^{x-1}, e^{y}$

① $\int_{PA} \langle e, 1, 1 \rangle \cdot \langle 0, 0, dt \rangle = 1$

$r_{PA}(t) = \langle 0, 0, t \rangle$
$\| r_{PA} \| = 1$

② $\int_{AB} \langle e^{t+1}, e^{-t}, e^{t} \rangle \cdot \langle 0, 1, 1 \rangle dt =$
$\int_0^1 e^{-t} + e^{t}\,dt$ ✓

Jesseme Bell 16.3 Calculus homework

1) $F(x,y,z) = xy\sin(z)$

$F(1,1,0) - F(0,0,0) = 0$ C: (0,0,0) to (1,1,0)

because F is conservative ✓

3) $F(x,y) = \langle 3, 6y \rangle$ $f(x,y) = 3x + 3y^2$

$\nabla f \cdot r$ $\nabla f = \langle 3, 6y \rangle$

$F(4, 1/2) - F(1,2) = -9/4$

$r(t) = \langle t, 2t^{-1} \rangle$ $r_0 = \langle 1, 2 \rangle$ $r_f = \langle 4, 1/2 \rangle$

5) $F(x,y) = ye^{z}i + xe^{z}j + xye^{z}k$

$F(x,y,z) = xye^{z}$ $r(t) = \langle t^2, t^3, t-1 \rangle$

$\nabla f = \langle ye^{z}, xe^{z}, xye^{z} \rangle$

$F(4,8,1) - F(1,1,0) = 32e^{-1}$

9) $F = y^2 i + (2xy + e^{z}) j + ye^{z} k$

$\int y^2\,dx = xy^2 + g(y,z)$

$\int (2xy + e^{z})\,dy = xy^2 + ye^{z} + g(x,z)$

$\int ye^{z}\,dz = ye^{z} + g(x,y)$

13) $F = \langle 2\sec^2 x, z, y + \tan x \rangle$

$\text{curl}(F) = \langle d/dx, d/dy, d/dz \rangle \cdot \langle 2\sec^2 x, z, y + \tan(x) \rangle$

$\int 2\sec^2 x\,dx = 2\tan(x) + g(y,z)$

$yz + 2\tan x)$

$\int z\,dy = yz + g(x,z)$

$\int y + \tan x\,dz = yz + z\tan x + g(x,y)$

18 $\int_C 2xyz\,dx + x^2 z\,dy + x^2 y\,dz$

Over the path $r(t) = \langle t^2, \sin(\pi t/4), e^{t^2 - 2t} \rangle$

for $0 \le t \le 2$

$r(t) = t^2, \sin(\pi t/4), e^{t^2 - 2t}$

$r'(t) = \langle 2t, 1, \frac{\pi}{4}\cos(\frac{\pi t}{4}) \rangle e^{t^2 - 2t} \langle 2t - 2 \rangle \, dt$ ✓

19) $F = x^2 y - z$, $r_1 = \langle t, t, 0 \rangle$ for $0 \le t \le 1$
and $r_2 = \langle t, t^2, 0 \rangle$ for $0 \le t \le 1$

$\int_C F \cdot dr = F(r_1(1)) - F(r_1(0)) = 1$ ✓