Second chance club for exam 2.

1. $r(t) = \langle e^{t^3}, t^2e^{t^4}, te^{t^7} \rangle$

$x = e^{t^3}$ $y = t^2e^{t^4}$ $z = te^{t^7}$

$\int_C yz\,dx + (xz + z)\,dy + (xy + y + 1)\,dz$

$= \int_0^1 t^2e^{t^4} \cdot te^{t^7} \cdot 3t^2e^{t^3}dt + (e^{t^3} \cdot te^{t^7} + te^{t^7}) \cdot (2te^{t^4} + 4t^5e^{t^4})dt$

$+ (e^{t^3} \cdot t^2e^{t^4} + t^2e^{t^4} + 1) \cdot (e^{t^7} + 7t^7e^{t^7})dt$

$= 30.193$

The error I had for this problem is that I didn't explain how I got the value. I will say I get the value by maple next time.

2. $(\frac{y}{5})^{\frac{1}{3}} \le x \le 1$

$0 \le y \le 5$

$(\frac{y}{5})^{\frac{1}{3}} = x$

$y = 5x^3$

$0 \le x \le 1$

$0 \le y \le 5x^3$

$\int_0^1 \int_0^{5x^3} \sin x^4\,dy\,dx$

$= \int_0^1 5x^3 \sin x^4\,dx$

$= \frac{5}{4}(1 - \cos 1)$

The error I had for this question is that I didn't explain how I got the value. I will say I get the value by maple or by hand next time..

4. $r(t) = \langle \cos t, t, \sin t \rangle$ $0 \le t \le 2\pi$

$r(0) = \langle 1, 0, 0 \rangle$

$r(2\pi) = \langle 1, 2\pi, 0 \rangle$

$\cancel{f(1,2\pi,0)}$ $f(1, 2\pi, 0) - f(1, 0, 0) = e^{\cos 1} + 1 - e^{\cos 1} + 1 = 0$.

The error I had for this question is that I did it in wrong way. I need to remember F is grad(f) so the answer is f(End) - f(start).

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5. $dxdydz = \rho^2 \sin\phi \, d\rho d\phi d\theta$

$\int_R (x^2+y^2+z^2)^3 \, dxdydz$

$x^2+y^2+z^2=\rho^2$

$\int_R (\rho^2)^3 \rho^2 \sin\phi \, d\rho d\phi d\theta$

$= \int_R \rho^8 \sin\phi \, d\rho d\phi d\theta$

$\rho<1, \ 0\le\phi\le\frac{\pi}{2}, \ 0\le\theta\le\frac{\pi}{2}$

$\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \int_0^1 \rho^8 \sin\phi \, d\rho d\phi d\theta$

$\int_0^1 \rho^8 d\rho \cdot \int_0^{\frac{\pi}{2}} \sin\phi \, d\phi \cdot \int_0^{\frac{\pi}{2}} d\theta = \frac{\pi}{18}$

The error I had for this problem is that I didn't know how to do it. I need to remember when to use spherical coordinates next time.

7.d. line$(x,y) = (1+t, 1)$ t goes to 0.

we get $\frac{1}{2}$. line$(x,y) = (1, 1+t)$ t goes to 0

we get 1. DNE.

The error I had for this problem is that I did in wrong way. I will use this the method to do it next time.

9. $z = 9-x^2-y^2$

$P = z \quad Q = z \quad R = x$

$\iint_S F\,dS = \iint_D (-z(-2x) - z(-2y) + x)\,dA$

$\iint_D z(2x+2y) + x\,dA$

$\int_0^3 \int_0^{\sqrt{9-y^2}} (9-x^2-y^2)\cdot(2x+2y) + x\,dx\,dy$

$= \frac{693}{5}$ because it's downward direction, so we need to $\times(-1)$ is $\frac{693}{5}\cdot(-1) = -\frac{693}{5}$.

The error I had for this problem is that I didn't multiply -1. If there is downward direction next, I will multiply it at last.

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1a. $r(t) = \langle t, t^2, t^3 \rangle$

$x=t \quad y=t^2 \quad z=t^3 \quad 0 \le t \le 1$

$\int_C x e^{xyz} dx + y e^{xyz} dy + z e^{xyz} dz$

$= \int_0^1 t \cdot e^{t^6} dt + t^2 \cdot e^{t^6} \cdot 2t\,dt + t^3 e^{t^6} \cdot 3t^2 dt$

$= \int_0^1 t e^{t^6} dt + 2t^3 e^{t^6} dt + 3t^5 e^{t^6} dt$

$= 2.311$ ~~Z~~.

1b $r(t) = \langle \sin t^2, \cos t^2 \rangle$

$x = \sin t^2 \quad y = \cos t^2 \quad 0 \le t \le \sqrt{\frac{\pi}{2}}$

$\int_C (4x^3y^2 + 1)dx + (2x^4 y + 1) dy$

$= \int_0^{\sqrt{\frac{\pi}{2}}} (4 \cdot (\sin t^2)^3 \cdot (\cos t^2)^2 + 1) \cdot \cos t^2 \cdot 2t\,dt + (2 \cdot (\sin t^2)^4 \cdot \cos t^2 + 1) \cdot (-\sin t^2) \cdot 2t\,dt$

$= 90.0002$

2a

$0 \le y \le e^x$

$0 \le x \le 1$

$y = e^x$

$x = \log_e y$.

$0 \le y \le 1$

$\log_e y \le x \le 1$

$\int_0^1 \int_{\log_e y}^1 f(x,y)\,dx\,dy$

2b. $0 \le y \le \sin x$

$0 \le x \le \pi$

$y = \sin x$

$x = \sin^{-1} y$

$0 \le y \le \pi$

$\sin^{-1} y \le x \le \pi$

$\int_0^{\pi} \int_{\sin^{-1} y}^{\pi} f(x,y)\,dx\,dy$

2c: $e^y \le x \le e$

$0 \le y \le 1$

$e^y = x$

$y = \log_e x$

$0 \le x \le e$

$0 \le y \le \log_e x$

$\int_0^e \int_0^{\log_e x} f(x,y)\,dy\,dx$

4a. $r(t) = \langle t, t^2, t^3 \rangle \quad 0 \le t \le 3$

$r(0) = \langle 0, 0, 0 \rangle$

$r(3) = \langle 3, 9, 27 \rangle$

~~$\sin(x(y^2+z^2))$~~

$f(\langle 3, 9, 27 \rangle) - f(0,0,0) = -0.545$

4b. $r(t) = \langle \sin 2t, \cos t \rangle$

$0 \le t \le \pi$

$r(0) = \langle 0, 1 \rangle$

$r(\pi) = \langle 0, -1 \rangle$

$f(0,-1) - f(0,1) = e^{\cos 0 + 3\sin(-1)} - e^{\cos 0 + 3\sin 1}$

$= -0.285 e$

5a.

$dxdydz = \rho^2 \sin\phi d\rho d\phi d\theta$

$\int_R (x+y)(x^2+y^2+z^2)^2 dxdydz$

$x^2+y^2+z^2=\rho^2$

$x = \rho\sin\phi\cos\theta \quad y = \rho\sin\phi\sin\theta$

$\int_R (\rho\sin\phi\cos\theta + \rho\sin\phi\sin\theta) \rho^6 \sin\phi d\rho d\phi d\theta$

$= \int_R \rho^6 \cdot \rho\sin\phi(\cos\theta+\sin\theta)\sin\phi d\rho d\phi d\theta$

$\rho<1 \quad -\frac{\pi}{2}\le\phi\le 0 \quad \frac{\pi}{2}\le\theta\ 0$.

$\int_{-\frac{\pi}{2}}^{0}\int_{-\frac{\pi}{2}}^{0}\int_0^1 \rho^7 \sin\phi(\cos\theta+\sin\theta)\sin\phi d\rho d\phi d\theta$

$\int_0^1 \rho^7 d\rho \cdot \int_{-\frac{\pi}{2}}^{0} \sin^2\phi d\phi \int_{-\frac{\pi}{2}}^{0} \cos\theta+\sin\theta d\theta = 0.$

5b $dxdydz = \rho^2\sin\phi d\rho d\phi d\theta$

$\int_R z(x^2+y^2+z^2) dxdydz$

$z=\rho\cos\phi \quad x^2+y^2+z^2=\rho^2$

$\int_R \rho\cos\phi \cdot \rho \cdot \rho^2\sin\phi d\rho d\phi d\theta$

$= \int_R \rho^4\cos\phi\sin\phi d\rho d\phi d\theta$

$\rho<1 \quad 0\le\phi\le\pi \quad 0\le\theta\le\pi$

$\int_0^\pi\int_0^\pi\int_0^1 \rho^4\cos\phi\sin\phi d\rho d\phi d\theta$

$\int_0^1 \rho^4 d\rho \cdot \int_0^\pi \cos\phi\sin\phi d\phi \cdot \int_0^\pi d\theta$

$= 0.$

5c $z=\rho\cos\phi \quad x=\rho\sin\phi\cos\theta$

$\int_R (\rho\cos\phi - \rho\sin\phi\cos\theta)\rho^2\sin\phi d\rho d\phi d\theta$

$= \int_R \rho^3\sin\phi\cos\phi - \rho^3\sin^2\phi\cos\theta d\rho d\phi d\theta$

$\rho<8 \quad 0\le\phi\le2\pi \quad 0\le\theta\le2\pi$

$\int_0^{2\pi}\int_0^{2\pi}\int_0^8 \rho^3\sin\phi\cos\phi d\rho d\phi d\theta - \int_0^{2\pi}\int_0^{2\pi}\int_0^8 \rho^3\sin^2\phi\cos\theta d\rho d\phi d\theta$

$= 0.$

7a. $\lim_{(x,y)\to(1,3)} \frac{x-1}{xy-3}$

$\frac{1-1}{3-3} = \frac{0}{0}$

$f(0.9999, 2.9999) = 1$

$f(1.0005, 3.0005) = 1$

$1=1$

the limit is 1

7b $\lim_{(x,y,z)\to(0,0,0)} \frac{x+y+2z}{2x+y+z}$

$\frac{0+0+0}{0+0+0} = \frac{0}{0}$.

$y=cx \quad z=dx$

$\frac{x+cx+2dx}{2x+cx+dx} = \frac{x(1+c+2d)}{x(2+c+d)}$

$= \frac{1+c+2d}{2+c+d}$

DNE.

9a. $g = 9 - x^2 - y^2$

$P = x + z \quad Q = y + z \quad R = -x$

$\iint_S F\,ds = \iint_S (-x-z)\cdot(-2x) - (y+z)(-2y) + (-x)\,dA$

$\iint_S 2x^2 + 2y^2 + 2xz + 2yz - x \, dA$

$\int_0^3 \int_0^{\cancel{\sqrt{9-y^2}}} 2x^2 + 2y^2 + 2x(9-x^2-y^2) + 2y(9-x^2-y^2) - x \, dx\,dy$

= I'm confused to get the region of x and y.

9b $g = 9 - x^2 - y^2$

$P = x + z \quad Q = y + z \quad R = -x$

$\iint_S F\,ds = \iint_S 2x^2 + 2y^2 + 2xz + 2yz - x \, dA$

$z = 9 - x^2 - y^2 \quad 0 < x < 1, \; 0 < y < 1 \quad z \geq 0$

Also the same concern about how to get the region of x and y.