Emily Foreacre
MAT 213
Professor Lia Vas
11/25/2024

Project #2

(1)
>> syms r x
>> % x is theta

>> fun = @(r, x) sqrt(1 + 36 * r.^2 .* cos(x).^2 + 256 * r.^2 .* sin(x).^2) .* r
fun =

  function_handle with value:

    @(r,x)sqrt(1+36*r.^2.*cos(x).^2+256*r.^2.*sin(x).^2).*r

>> SA = integral2(fun, 9, 11, 0, 2*pi)
SA =

   1.4596e+04

(2a)
>> syms p q r
>>int(int(int((p^2+q)*r,r,0,9*p+q^2),q,0,sqrt(5*p)),p,0,3)

 ans = (28188*15^(1/2))/11 + 54405/16

(2b)
>> syms x y z
>>int(int(int(x*z+y^2,x,0,5*y+9*z),z,0,sqrt(y)),y,0,3+1)

 ans = 127352/63

(3a)

```
>> syms r
>> int(r^29, 1/2, 3)

ans = 442147839441466671579955/6442450944

>> syms s
>> int(sin(s)^19*cos(s)^9, 0, pi/2)

ans = 1/20020

>> syms t
>> int(cos(t)^18, 0, pi)

ans = (12155*pi)/65536

>> (442147839441466671579955/6442450944)*(1/20020)*((12155*pi)/65536)

ans = 1.9975e+08
```

(3b)
```
>> syms r s t
>> int( sin(s), 0, pi/2)

ans = 1

>> int(r^2, 1/2, 3)

ans = 215/24

>> 215/24

ans = 8.9583

>> 8.9583*pi

ans = 28.1433

>> 1.9975e+08/28.1433

ans = 7.0976e+06
```
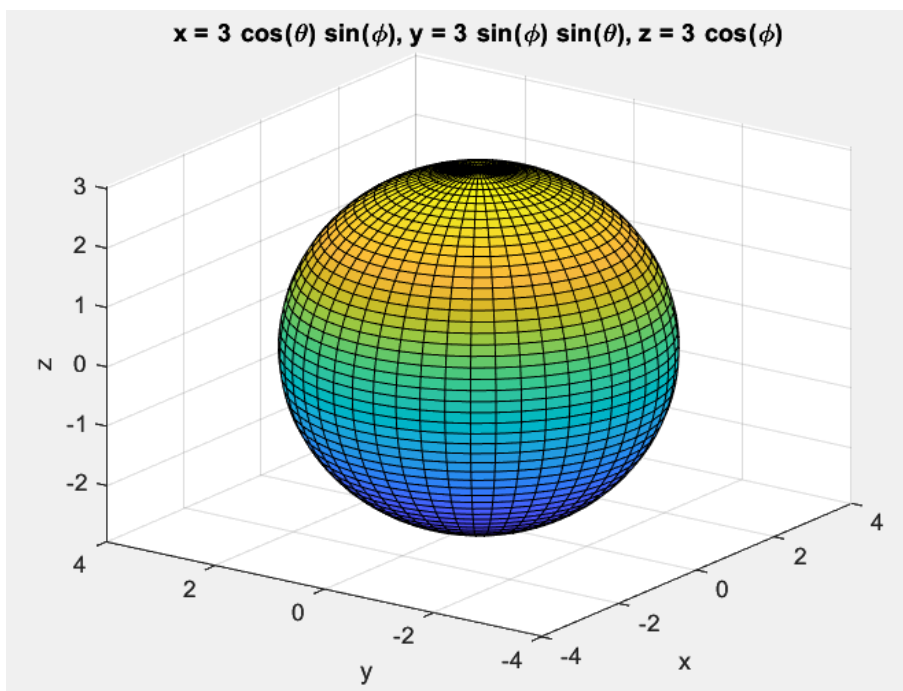
(4a)
```
>> syms t s
>> ezsurf(3*cos(t)*sin(s),3*sin(t)*sin(s),3*cos(s),[0,pi,0,2*pi])
```


$x = 3 \cos(\theta) \sin(\phi)$, $y = 3 \sin(\phi) \sin(\theta)$, $z = 3 \cos(\phi)$

(4b)

```
>> syms p m n r s t

>>  % p = 3 + 9
>> p = 12

>> % m = 5 + 2
>> m = 7

>> % n = 9 + 2
>> n = 11

>> r = 3 * (1 + (1/p) * sin(m*t) * sin(n*s));

>>  ezsurf(r*cos(t)*sin(s),r*sin(t)*sin(s),r*cos(s),[0,pi,0,2*pi])
```
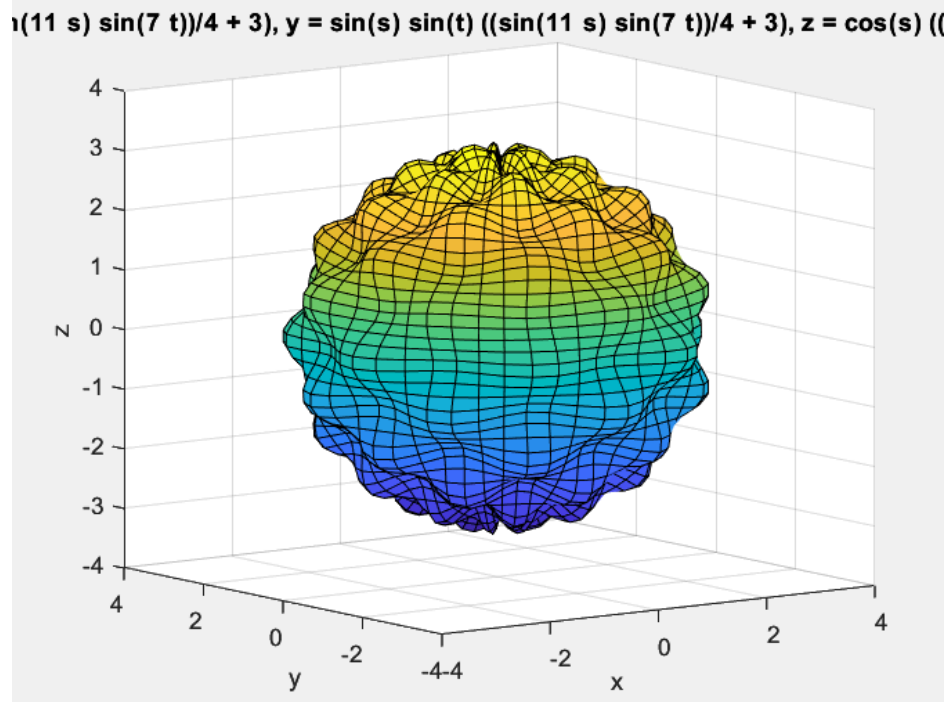

(4c)

```
>> syms t s r
>> volume = int(int(int(r^2*sin(s), r, 0, 1+1/12*sin(7*t)*sin(11*s)), s, 0, pi), t, 0, 2*pi)
volume = (23305*pi)/644
= 113.69
```

(5a)
>> syms n
>>symsum ((n+1)^(2*5)/3^(n+1),0,inf)

ans =

2579313/2
% Since the answer we got is a finite number, the series is convergent.

(5b)
>> syms n
>> symsum(n^9+3*(n+1)/n^(9+1)+5*(n+2),1,inf)

ans =

Inf
% Since we got Inf as our answer, the series is divergent