Dr. Leon VanDommelen (11/07/19) 2

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IMPORTANT:

Do not change **anything** in this header (besides your name and exam date above as needed)!

Put your solution to the question completely at the end of this file.

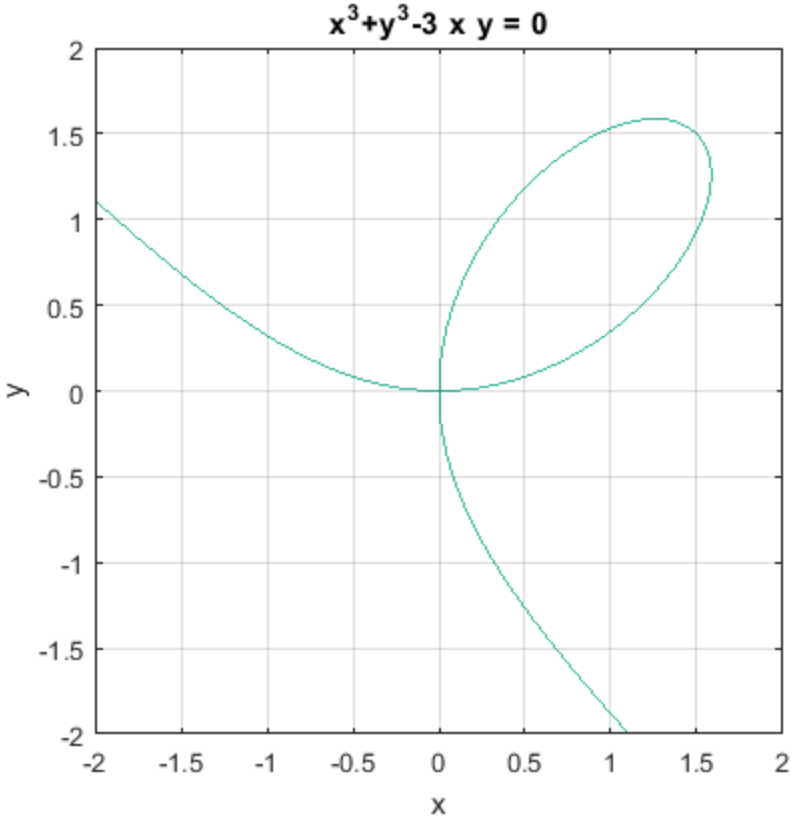
EXAM 2, Question 2

```
if ~exist('___code___','var') ; clear ; end
format compact
more off
```

SOLUTION:

a)

```
% plot the folium
ezplot('x^3+y^3-3*x*y',[-2 2 -2 2])
axis('square')
grid on
```



b)

```
% declare x and y as symbols
syms x y
% solve the equation of the lemniscate for y
lemSol=solve((x^2+y^2)^2==x^2-y^2,y)
% find the y-values if x is sqrt(3/8)
yVals=subs(lemSol,x,sym('sqrt(3/8)'))
pretty(yVals)
% take the real roots out of there
y1=yVals(2)
y2=yVals(4)
% collect the coefficients of the powers of y
lemRewritten=collect((x^2+y^2)^2-x^2+y^2,y)
```

```
lemSol =
  (- x^2 - (8*x^2 + 1)^(1/2)/2 - 1/2)^(1/2)
    ((8*x^2 + 1)^(1/2)/2 - x^2 - 1/2)^(1/2)
 -(- x^2 - (8*x^2 + 1)^(1/2)/2 - 1/2)^(1/2)
   -((8*x^2 + 1)^(1/2)/2 - x^2 - 1/2)^(1/2)
yVals =
  (8^(1/2)*15^(1/2)*1i)/8
                8^(1/2)/8
 -(8^(1/2)*15^(1/2)*1i)/8
               -8^(1/2)/8
/  sqrt(8) sqrt(15) 1i  \
```

```
|  -------------------  |
|           8           |
|                       |
|        sqrt(8)        |
|        -------        |
|           8           |
|                       |
|   sqrt(8) sqrt(15) 1i |
| - ------------------- |
|            8          |
|                       |
|         sqrt(8)       |
|       - -------       |
|            8          |
\                       /
```

```
y1 =
8^(1/2)/8
y2 =
-8^(1/2)/8
lemRewritten =
y^4 + (2*x^2 + 1)*y^2 + x^4 - x^2
```

c)

```
% declare s to be a symbol
syms s
% form the ratio
ratSym=(s^3-2*s^2-5*s+6)/(s^4-16)
% factor it, combining the factors together
ratSymFactors=factor(ratSym)
ratSymFactors=prod(ratSymFactors)
% find the partial fractions and show them pretty
ratSymPartfrac=partfrac(ratSym)
pretty(ratSymPartfrac)
```

```
ratSym =
-(- s^3 + 2*s^2 + 5*s - 6)/(s^4 - 16)
ratSymFactors =
[ s - 1, s - 3, 1/(s - 2), 1/(s^2 + 4)]
ratSymFactors =
((s - 1)*(s - 3))/((s^2 + 4)*(s - 2))
ratSymPartfrac =
((9*s)/8 - 7/4)/(s^2 + 4) - 1/(8*(s - 2))
9 s   7
--- - -
 8    4       1
------- - ---------
  2       8 (s - 2)
 s  + 4
```

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