ENGINEERING MATHEMATICS-I
MATLAB

Department of Science and Humanities

Radius Of Curvature:

Find the radius of curvature of the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ at any point (x,y) of the curve.

```
>> syms x y a
>> F(x,y)=x^(2/3)+y^(2/3)-a^(2/3);
>> dy_dx = - diff(F,x)/diff(F,y)
```

Out put: dy_dx(x, y) =-y^(1/3)/x^(1/3)

```
>> G(x,y)=-y^(1/3)/x^(1/3);
>> a=diff(G,x);
>> b=diff(G,y);
>> c=a+b*G(x,y)
```

Out put: c(x, y) =1/(3*x^(2/3)*y^(1/3)) + y^(1/3)/(3*x^(4/3))

Radius Of Curvature Continued…

>> simplify(c)

Out put: (x, y) =(x^(2/3) + y^(2/3))/(3*x^(4/3)*y^(1/3))

>> d=(1+G(x,y)^2)^(3/2)

Out put: d =(y^(2/3)/x^(2/3) + 1)^(3/2)

>> rho=d/c

Out put: rho(x, y) =(y^(2/3)/x^(2/3) + 1)^(3/2)/(1/(3*x^(2/3)*y^(1/3)) + y^(1/3)/(3*x^(4/3)))

>> simplify(rho(x,y))

Out put: (y^(2/3)/x^(2/3) + 1)^(3/2)/(1/(3*x^(2/3)*y^(1/3)) + y^(1/3)/(3*x^(4/3)))

Radius Of Curvature Continued…

Find the radius of curvature of the curve $xy = c^2$ at any point (x,y) of the curve.

```
>> syms x y a
 F(x,y)=x*y-a^2;
 dy_dx = - diff(F,x)/diff(F,y)
```

Out put: dy_dx(x, y) =-y/x

```
 G(x,y)=-y/x;
a=diff(G,x);
 b=diff(G,y);
 c=a+b*G(x,y)
```

Out put: c(x, y) =(2*y)/x^2

Radius Of Curvature Continued…

>> d=(1+G(x,y)^2)^(3/2)

Out put: d =(y^2/x^2 + 1)^(3/2)

>> rho=d/c

Out put: rho(x, y) =(x^2*(y^2/x^2 + 1)^(3/2))/(2*y)

>> simplify(rho)

Out put: (x, y) =(x^2*(y^2/x^2 + 1)^(3/2))/(2*y)

Radius Of Curvature Continued…

Find the radius of curvature of the curve $r = e^{2\theta}$ at any point on the curve.

```
>> syms theta
>> r=exp(2*theta);
>> r1=diff(r,theta);
>> r2=diff(diff(r,theta));
>> a=(r^2+r1^2)^(3/2)
```

Out put: a =(5*exp(4*theta))^(3/2)

```
>> b=r^2+2*r1^2-r*r2
```

Out put: b =5*exp(4*theta)

```
>> rho=a/b
```

Out put: rho =(exp(-4*theta)*(5*exp(4*theta))^(3/2))/5

Radius Of Curvature Continued…

>> simplify(rho)

Out put: 5^(1/2)*exp(4*theta)^(1/2)

Radius Of Curvature Continued…

Find the radius of curvature of the parametric curve $x = 6t^2 - 3t^4$, $y = 8t^3$.

```
>> syms t
>> x=6*t^2-3*t^4;
>> x1=diff(x,t);
>> x2=diff(diff(x,t));
>> y=8*t^3;
>> y1=diff(y,t);
>> y2=diff(diff(y,t));
>> a=(x1^2+y1^2)
```

Out put: a =(- 12*t^3 + 12*t)^2 + 576*t^4

```
>> b=simplify(a)
```

Out put: b =144*t^2*(t^2 + 1)^2

Radius Of Curvature Continued…

>> c=(x1*y2)-(y1*x2)

Out put: c =48*t*(- 12*t^3 + 12*t) + 24*t^2*(36*t^2 - 12)

>> d=simplify(c)

Out put: d =288*t^2*(t^2 + 1)

>> e=b^(3/2)

Out put: e =(144*t^2*(t^2 + 1)^2)^(3/2)

>>rho=e/d

Out put: rho =(144*t^2*(t^2 + 1)^2)^(3/2)/(288*t^2*(t^2 + 1))

>>simplify(rho)

Out put: rho= (6*(t^2*(t^2 + 1)^2)^(3/2))/(t^2*(t^2 + 1))

THANK YOU