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> # Quiz 8 Solutions
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```
> restart;
```

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> # Question 1(i)
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```
> f:=sqrt(x+1);
```

$$f := \sqrt{x + 1}$$

```
> S:=series(f,x=0,6);
```

$$S := 1 + \frac{1}{2}x - \frac{1}{8}x^2 + \frac{1}{16}x^3 - \frac{5}{128}x^4 + \frac{7}{256}x^5 + O(x^6)$$

```
> P5:=convert(S,polynomial);
```

$$P5 := 1 + \frac{1}{2}x - \frac{1}{8}x^2 + \frac{1}{16}x^3 - \frac{5}{128}x^4 + \frac{7}{256}x^5$$

```
> # Question 1(ii)
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```
> A1:=subs(x=1/2,P5);
```

$$A1 := \frac{10035}{8192}$$

```
> # Question 1(iii)
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```
> A2:=subs(x=1/2,f);
```

$$A2 := \frac{1}{2} \sqrt{3} \sqrt{2}$$

```
> evalf(A2-A1);
```

$$-0.000230714$$

```
> # Question 2(i)
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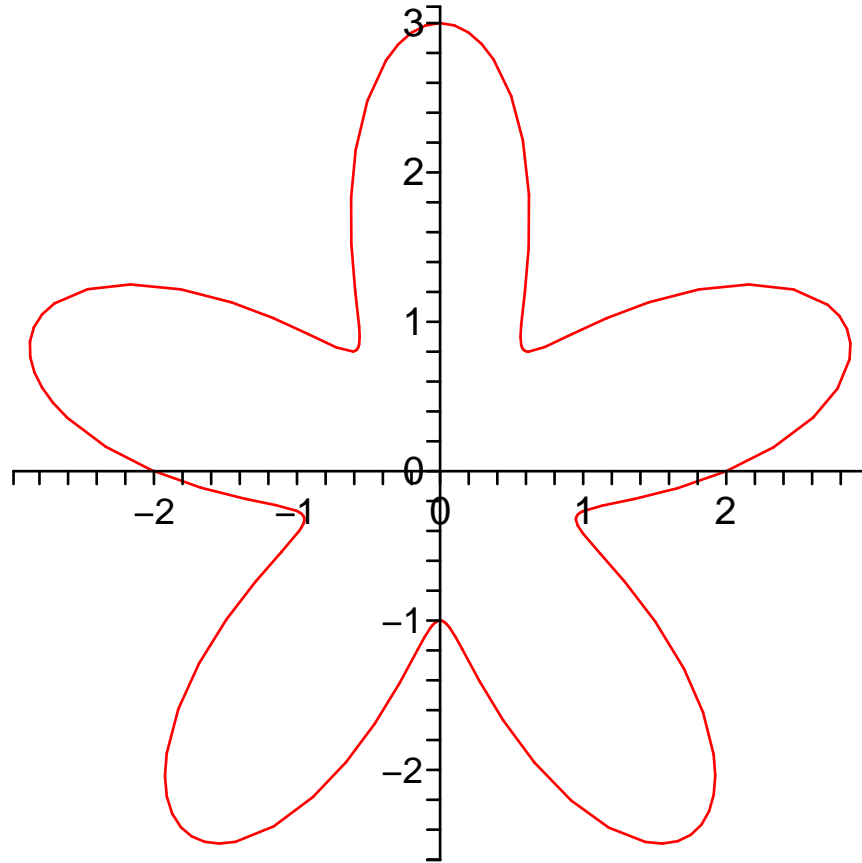
```
> f:=cos(t)*(2+sin(5*t));
```

```
g:=sin(t)*(2+sin(5*t));
```

$$f := \cos(t) (2 + \sin(5 t))$$

$$g := \sin(t) (2 + \sin(5 t))$$

```
> plot([f,g,t=0..2*Pi]);
```



```
> df:=diff(f,t);
dg:=diff(g,t);
```

$$df := -\sin(t)(2 + \sin(5t)) + 5 \cos(t) \cos(5t)$$

$$dg := \cos(t)(2 + \sin(5t)) + 5 \sin(t) \cos(5t)$$

```
> # Use capital letter I in Int to prevent Maple from trying
# to find an antiderivative
S:=Int(sqrt(df^2+dg^2),t=0..2*Pi);
```

$$S := \int_0^{2\pi} \sqrt{(-\sin(t)(2 + \sin(5t)) + 5 \cos(t) \cos(5t))^2 + (\cos(t)(2 + \sin(5t)) + 5 \sin(t) \cos(5t))^2} dt$$

```
> evalf(S);
```

24.65808943

```
> # Question 2(ii)
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> # the point (2,0) occurs when t=0

> M:=dg/df;

$$M := \frac{\cos(t) (2 + \sin(5 t)) + 5 \sin(t) \cos(5 t)}{-\sin(t) (2 + \sin(5 t)) + 5 \cos(t) \cos(5 t)}$$

> temp1:=subs(t=0,M);

$$\text{temp1} := \frac{\cos(0) (2 + \sin(0)) + 5 \sin(0) \cos(0)}{-\sin(0) (2 + \sin(0)) + 5 \cos(0)^2}$$

> simplify(temp1);

$$\frac{2}{5}$$

> # Question 2(iii)

> ddf:=diff(df,t);

ddg:=diff(dg,t);

$$ddf := -\cos(t) (2 + \sin(5 t)) - 10 \sin(t) \cos(5 t) - 25 \cos(t) \sin(5 t)$$

$$ddg := -\sin(t) (2 + \sin(5 t)) + 10 \cos(t) \cos(5 t) - 25 \sin(t) \sin(5 t)$$

> kappa:=simplify(subs(t=0,(df*ddg-ddf*dg)/(df^2+dg^2)^(3/2)));

$$\kappa := \frac{54}{841} \sqrt{29}$$

> rho:=1/kappa;

$$\rho := \frac{29}{54} \sqrt{29}$$

>