

Maple program to determine and calculate the CMR for a differential pair.

```
STUDENT > SR:=10;GBW:=2.5e6;CL:=30e-12;CMR:=4;VDD:=2.5;VSS:=-2.5;
```

```
SR := 10
```

```
GBW := .25 107
```

```
CL := .30 10-10
```

```
CMR := 4
```

```
VDD := 2.5
```

```
VSS := -2.5
```

```
STUDENT > KPN:=5.1169e-5;KPP:=1.6528e-5;VTN:=0.7339;VTP:=0.7776;
```

```
KPN := .000051169
```

```
KPP := .000016528
```

```
VTN := .7339
```

```
VTP := .7776
```

```
STUDENT > Itail:=SR/1e-6*CL;
```

```
Itail := .000300
```

```
STUDENT > gm12:=GBW*6.2832*CL;
```

```
gm12 := .00047124000
```

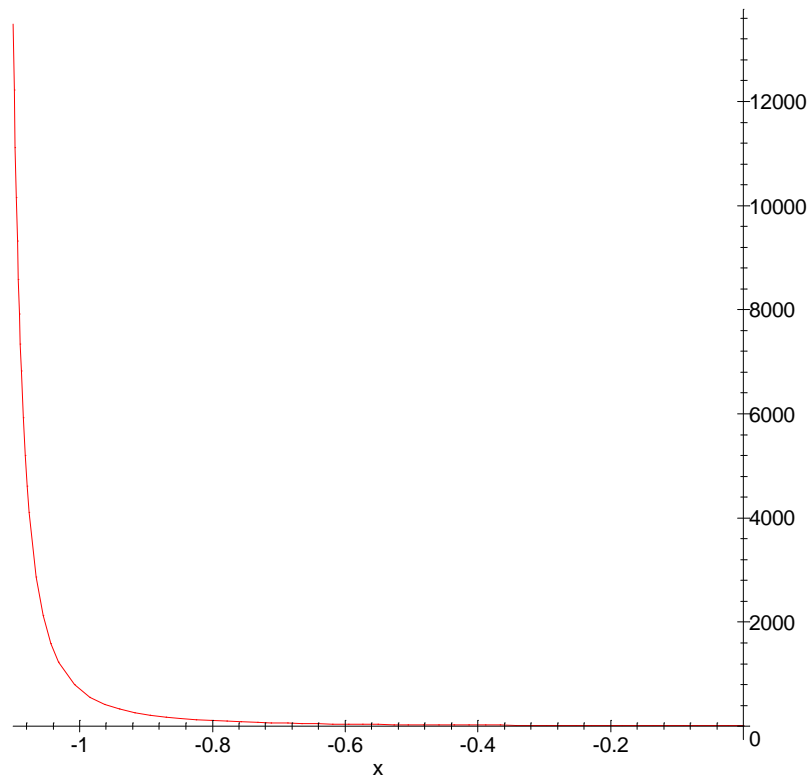
```
STUDENT > WL12:=gm12^2/(KPN*Itail);
```

```
WL12 := 14.46625480
```

```
STUDENT > WL34:=x->1/((x-VTN-VSS-sqrt(Itail/(KPN*WL12)))^2*(KPN/(2*Itail)));
```

$$WL34 := x \rightarrow 2 \frac{Itail}{\left(x - VTN - VSS - \sqrt{\frac{Itail}{KPN WL12}} \right)^2 KPN}$$

```
STUDENT > plot(WL34(x), x=-1.1..0);
```



```
STUDENT > CMRN:=-1;
```

CMRN := -1

```
STUDENT > WL34(CMRN);
```

699.4028958

```
STUDENT > Vinmin:=sqrt(Itail/(KPN*WL12))+VTN+sqrt((2*Itail)/(KPN*WL3
4(CMRN)))+VSS;
```

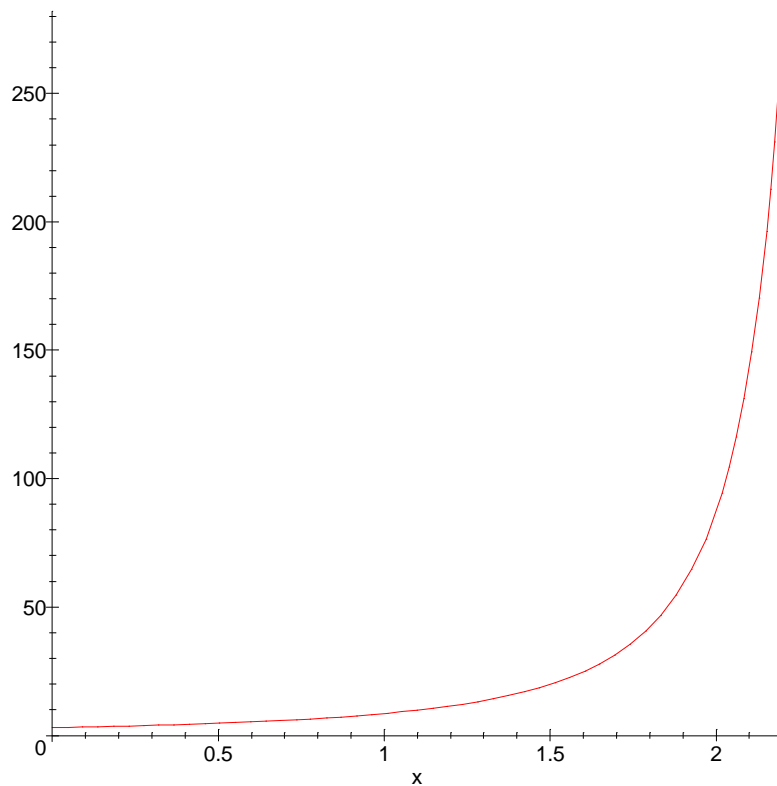
Vinmin := -1.0000000000

```
STUDENT > WL56:=x->Itail/(KPP*(VDD-VTP+VTN-x)^2);
```

$$WL56 := x \rightarrow \frac{Itail}{KPP (VDD - VTP + VTN - x)^2}$$

```
STUDENT >
```

```
STUDENT > plot(WL56(x),x=0..2.2);
```



```
STUDENT > CMRP:=2;
```

```
CMRP := 2
```

```
STUDENT > WL56(CMRP);
```

```
87.17661728
```

```
STUDENT > Vinmax:=VDD - sqrt(Itail/(KPP*WL56(CMRP)))-VTP+VTN;
```

```
Vinmax := 2.000000000
```

```
STUDENT > VG3:=sqrt((2*Itail)/(KPN*WL34(CMRN)))+VTN+VSS;
```

```
VG3 := -1.636618284
```

```
STUDENT > Rbias:=(VDD-VG3)/Itail;
```

```
Rbias := 13788.72761
```

```
STUDENT >
```