# Problem 21.30

```
clear
constant
```

```
k =
8.9900e+09
e0 =
8.8500e-12
e =
1.6020e-19
```

```
syms x real, assume(0<x & x<8)
q = [e -27*e], q3 = 4*e
```

```
q = 1×2
10^-17 ×
    0.0160   -0.4325
q3 =
6.4080e-19
```

```
r = [x (x-0.08)]
```

```
r =
```

$$\left(x \quad x-\frac{2}{25}\right)$$

(a) coordinate of particle 3 for minimum F3,net

```
% each row is direction pointing to 3 from 1, 2
u = [1; -1]
```

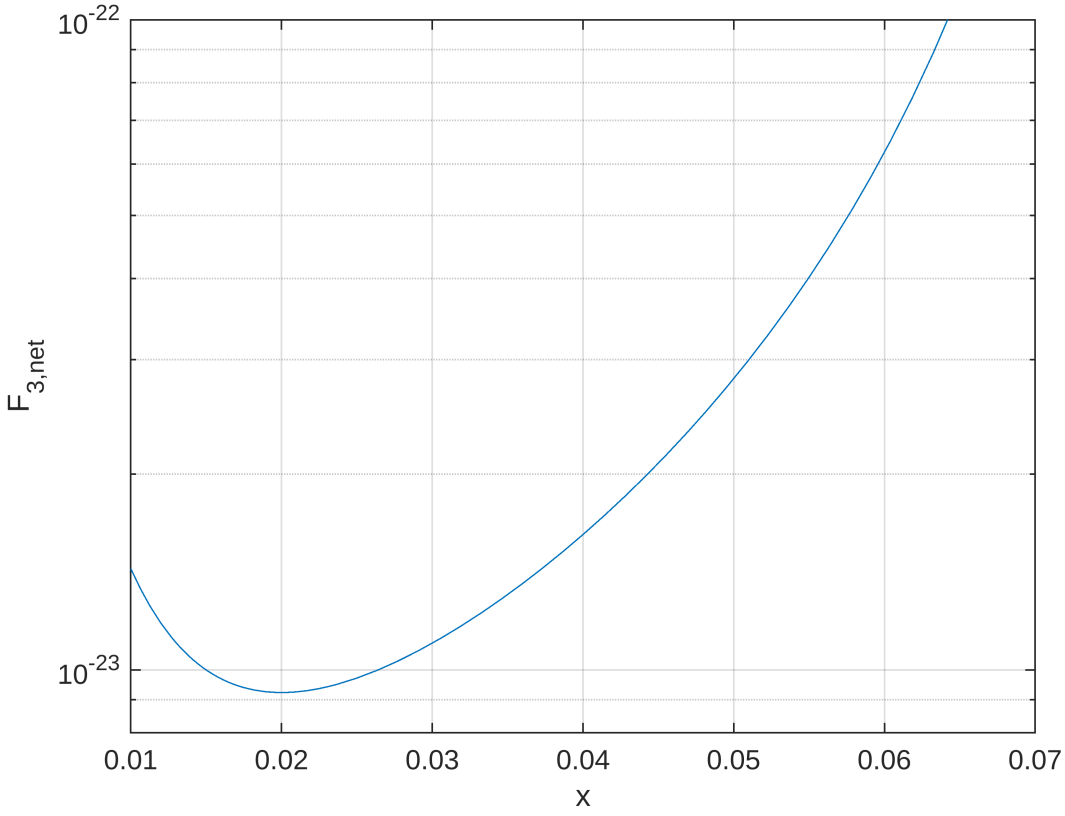
```
u = 2×1
     1
    -1
```

```
F3net = vpa(k*q*q3./r.^2*u,3)
```

```
F3net =
```

$$\frac{2.49\text{e-}26}{(x-0.08)^2}+\frac{9.23\text{e-}28}{x^2}$$

```
fplot(F3net,[0.01 0.07]), ylim([8e-24 1e-22]), yscale('log'), grid on
xlabel('x'), ylabel('F_{3,net}')
```




```
xmin = vpa(solve(diff(F3net,x)==0,x),3)
```

```
xmin = 0.02
```

(b) Value at the point

```
vpa(subs(F3net,x,xmin),3)
```

```
ans = 9.23e-24
```