

jupyter

January 13, 2025

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[ ]: from sympy import *
init_printing(use_latex="mathjax")
from IPython.display import display as print
import numpy as np
import matplotlib.pyplot as plt
plt.rcParams.update({"xtick.top": True, "ytick.right": True,
                    "xtick.minor.visible": True, "ytick.minor.visible": True,
                    "xtick.direction": "in", "ytick.direction": "in",
                    "axes.labelsize": "large", "text.usetex": True, "font.
↪size": 13
                    })
```

```
[34]: a = symbols("a")

a1 = Matrix([a, 0, 0])
a2 = Matrix([0, a, 0])
a3 = Matrix([a/2, a/2, a/2])

V = a1.dot(a2.cross(a3))

b1 = 2 * pi * (a2.cross(a3)) / V
b2 = 2 * pi * (a3.cross(a1)) / V
b3 = 2 * pi * (a1.cross(a2)) / V

print(simplify(b1))
print(simplify(b2))
print(simplify(b3))
```

$$\begin{bmatrix} \frac{2\pi}{a} \\ 0 \\ -\frac{2\pi}{a} \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ \frac{2\pi}{a} \\ -\frac{2\pi}{a} \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 0 \\ \frac{4\pi}{a} \end{bmatrix}$$

```
[99]: r,R = symbols("r R", real=True)
k = symbols("k", positive=True)

f = r*sin(k*r)/k
g = f.integrate((r,0,R)).subs({R:1})
h = lambdify(k, g, "numpy")

X = np.linspace(0,20,1000)
Y = h(X)

plt.axhline(0,linestyle="--",c="black",alpha=0.5)
plt.plot(X,Y)
plt.xlim(0,20)
plt.xlabel("$kR$ in 1")
plt.ylabel(r"$\rho$ in $\pi \rho_0 R^3$")
plt.title("Formfaktor einer homogen geladene Kugel")
plt.savefig("formfaktor.pdf")
```

```
<lambdifygenerated-16>:2: RuntimeWarning: divide by zero encountered in divide
return (-cos(k)/k + sin(k)/k**2)/k
```

```
<lambdifygenerated-16>:2: RuntimeWarning: invalid value encountered in divide
return (-cos(k)/k + sin(k)/k**2)/k
```



