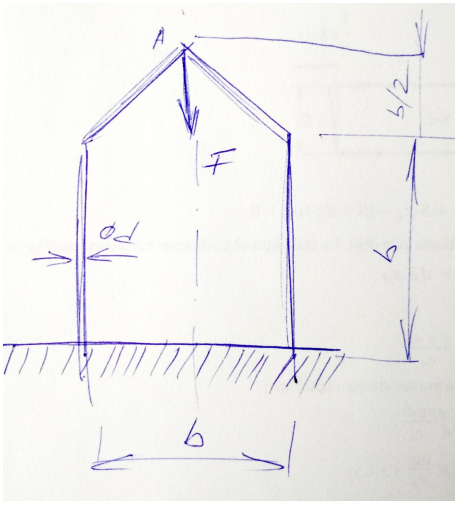
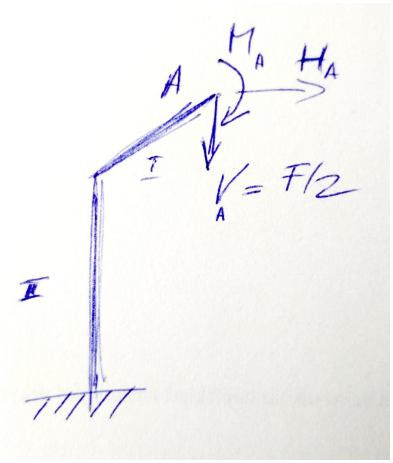
# Staticky neučitý křivý prut

## Zadání

U zadaného křivého protu určete svislý posuv působiště síly F




## Řešení




In[ ]:=
```
kvadr = J → π d^4 / 64;
```

### Intervaly

```
xI ∈ ⟨0, b/2 √2⟩;
xII ∈ ⟨0, b⟩;
```

## Vnitřní statické účinky

```
MI = MA + VA xI √2/2 + HA xI √2/2;
MII = MA + VA b/2 + HA (xII + b/2);
```

## Deformační energie

```
U = (∫_0^(b/2 √2) MI^2/(2 E J) dxI + ∫_0^b MII^2/(2 E J) dxII) // Simplify
```

$$\frac{\sqrt{2}\ b\left(12\,MA^2+6\,b\,MA\,(HA+VA)+b^2\,(HA+VA)^2\right)+\frac{-(2\,MA+b\,(HA+VA))^3+(2\,MA+b\,(3\,HA+VA))^3}{HA}}{48\,J\,\mathbb{E}}$$

## Deformační podmínky

```
nezname = Solve[{D[U, MA] == 0, D[U, HA] == 0}, {HA, MA}][[1]]
```

$$\left\{HA \to -\frac{VA+10\sqrt{2}\ VA}{9+32\sqrt{2}},\ MA \to -\frac{2\left(9\,b\,VA+7\sqrt{2}\ b\,VA\right)}{\left(2+\sqrt{2}\right)\left(9+32\sqrt{2}\right)}\right\}$$

## Svislý posuv bodu A

```
D[U, VA] /. nezname /. VA → F/2 // Simplify
```

$$\frac{\left(4+3\sqrt{2}\right)b^3\,F}{6\left(82+73\sqrt{2}\right)J\,\mathbb{E}}$$

```
D[U, VA] /. nezname /. VA → F/2 /. kvadr // Simplify
```

$$\frac{32\left(4+3\sqrt{2}\right)b^3\,F}{3\left(82+73\sqrt{2}\right)d^4\,\pi\,\mathbb{E}}$$

```
D[U, VA] /. nezname /. VA → F/2 /. kvadr // N
```

$$\frac{0.151083\,b^3\,F}{d^4\,\mathbb{E}}$$