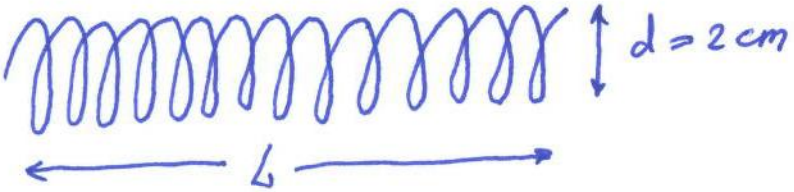
#19.28



$L = 30\ cm$

SOLENOID

$N = 500$ coils

$I = 5\ A$

$\mu = 1.257 \times 10^{-6}\ T \cdot m/A$

What is B in the center?

B - ? ($d \ll L$) (N is big)

To find B in center of coil of solenoid not too close to the ends use Eq. (19.5) (see p. 774 - 775 for details about solenoid)

$$B_z \approx \mu n I$$

(note that you need to find n first: $n = \frac{N}{L}$

$$\Rightarrow \underline{B_z \approx \mu \frac{N}{L} I}$$

plug in #'s to get numerical answer.
(I did this in Maple, see next page)

$$\boxed{B = 10.47 \times 10^{-3}\ T}$$

```
> restart;
```

 # number of coils

```
> N:=500;
```

$$N := 500 \tag{1}$$

$$Is := 5$$

 # current through the solenoid (Maple does not allow me to define it as "I" because there is already predefined "I" in it)

```
> Is:=5;
```

$$Is := 5 \tag{2}$$

 # permeability of aluminium

```
> mu:=1.257*10^(-6);
```

$$\mu := 0.000001257000000 \tag{3}$$

 # lenght of solenoid

```
> L:=30*10^(-2);
```

$$L := \frac{3}{10} \tag{4}$$

 # equation for finding B field of solenoid

```
> B:=mu*(N/L)*Is;
```

$$B := 0.01047500000 \tag{5}$$

```
>
```