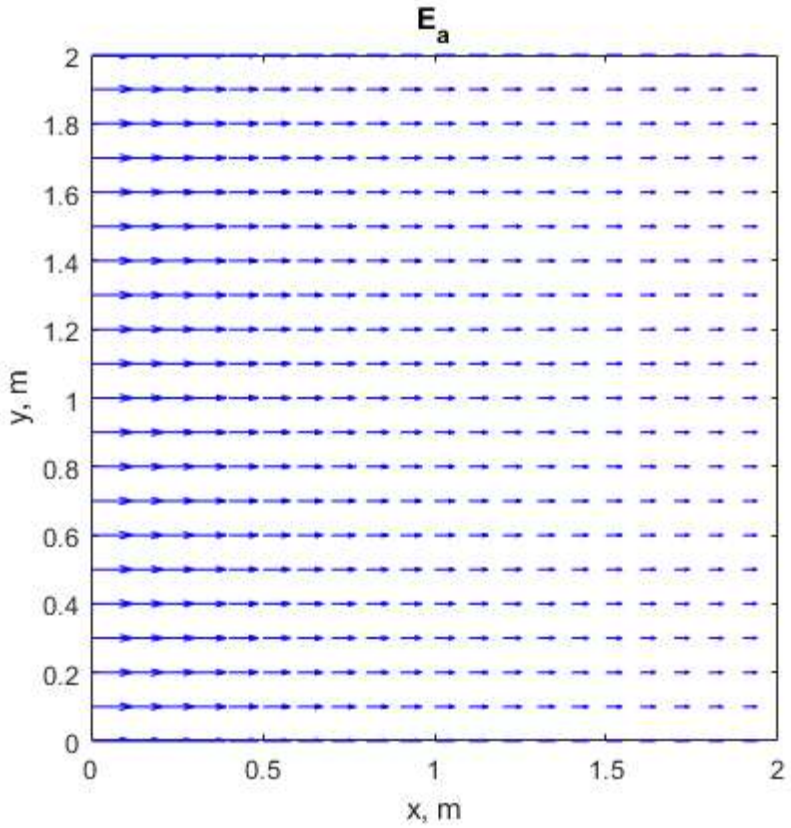
Contents

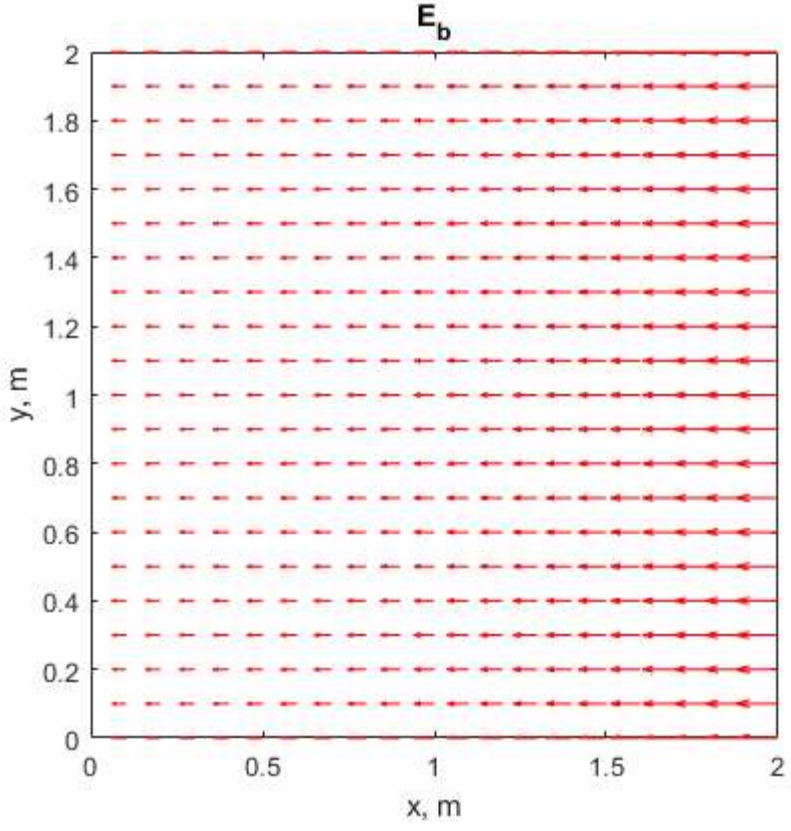

```
% LAB 2a-A: Visualizing Vectors
```

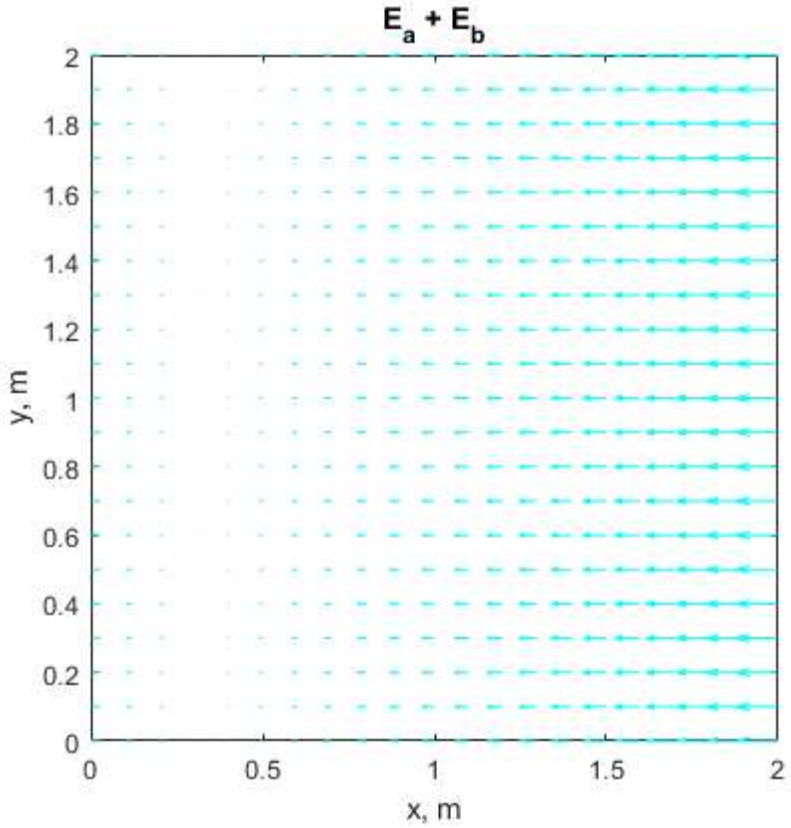
Superposition of vector fields

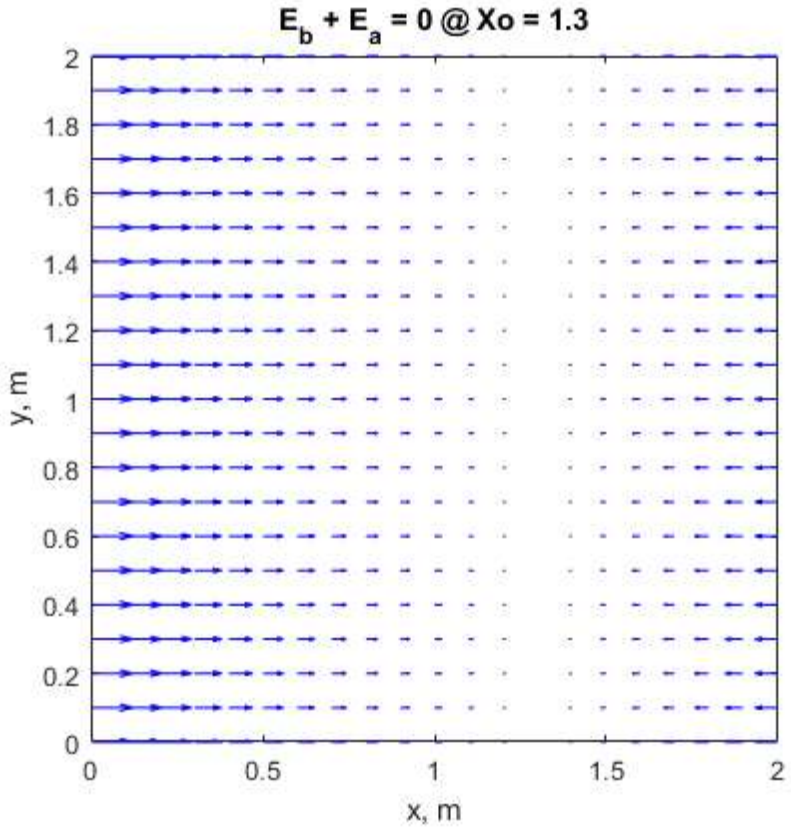
```
x = linspace(0, 2, 21);
y = linspace(0, 2, 21);
[X, Y] = meshgrid(x, y);

A = 1;
B = 2;
Xa = -1;
Xb = 3;

Ea = A./(X - Xa);
Eb = B./(X - Xb);

% E_a
figure
quiver(X ,Y ,Ea , 0*X,'b')

xlabel('x, m')
xlim ([0, 2])
ylabel('y, m')
ylim([0, 2])

title('E_a')
axis square

% E_b
figure
quiver(X, Y, Eb, 0*X, 'r')

xlabel('x, m')
xlim ([0, 2])
ylabel('y, m')
ylim([0, 2])

title('E_b')
axis square

%E_a + E_b
figure
quiver(X, Y, Ea+Eb, 0*X, 'c')

xlabel('x, m')
xlim ([0, 2])

ylabel('y, m')
ylim([0, 2])

title('E_a + E_b')
```

```
axis square
xticks(0: 0.5 :2)

%E_a + E_b = 0 @ Xo = 1.3
figure
Eb = 0.739 ./(X-Xb);
quiver(X, Y, Ea + Eb, 0*X, 'b')

xlabel('x, m')
xlim ([0, 2])

ylabel('y, m')
ylim([0, 2])

title('E_b + E_a = 0 @ Xo = 1.3')
axis square
xticks(0 :0.5: 2)
```


E_a
y, m
x, m
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0.5
1.5


E_b
y, m
x, m
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0.5
1.5

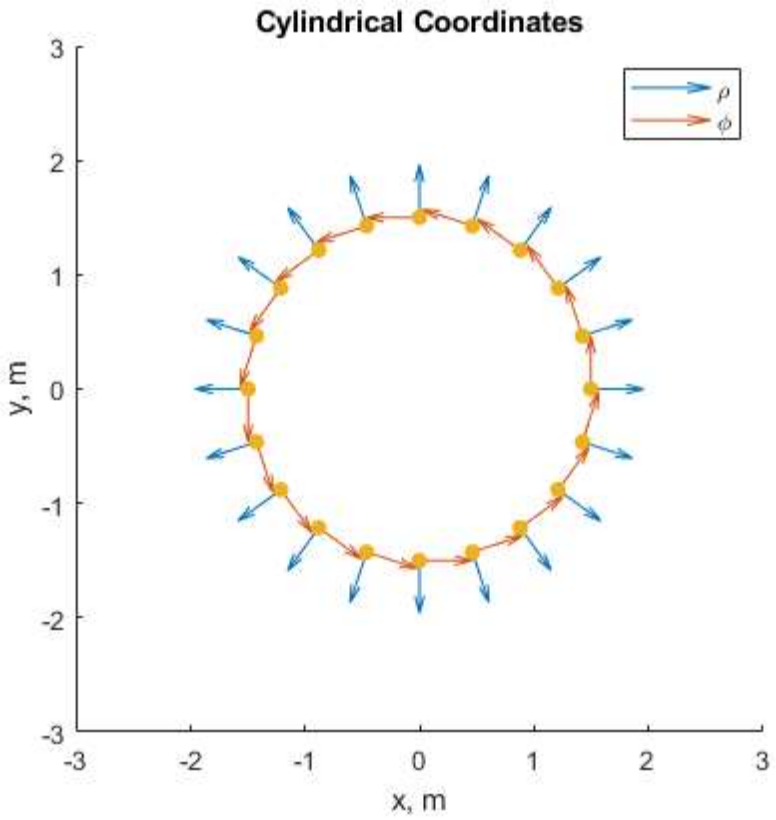




Cylindrical Coordinates

```
%cylindrical to cartesian conversions
figure
phi  = (0: pi/10: 2*pi);
```

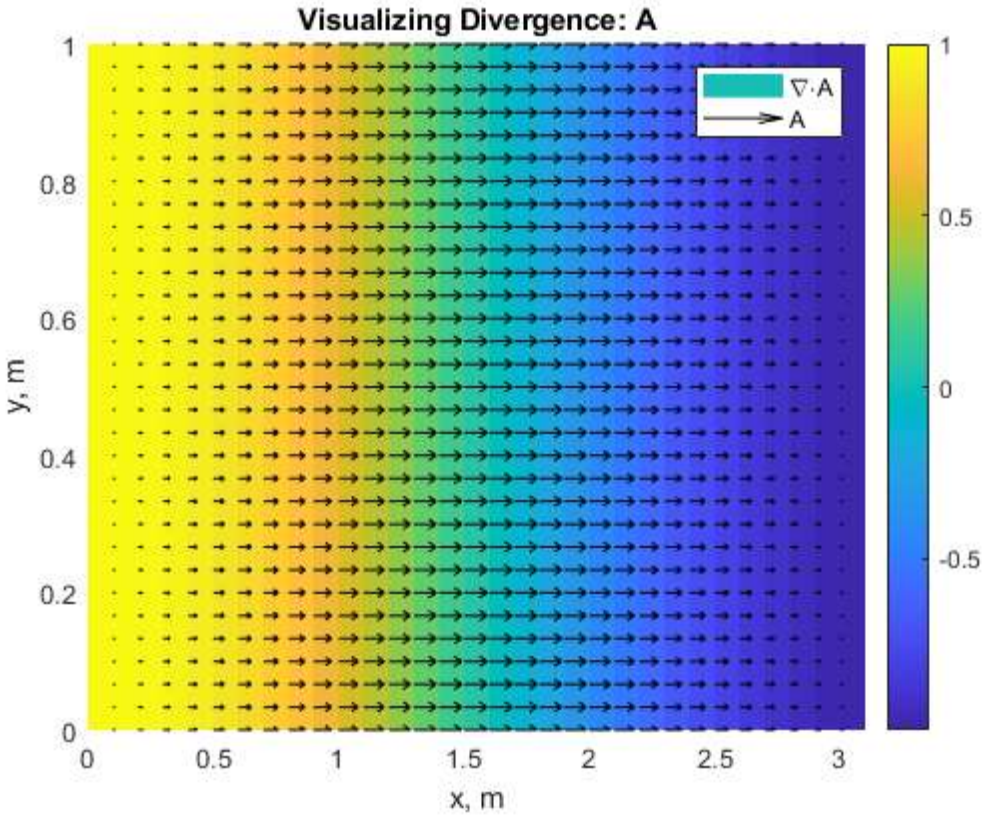
```
x    = 1.5*cos(phi);
rhox = cos(phi);
phix = -sin(phi);

y    = 1.5*sin(phi);
rhoy = sin(phi);
phiy = cos(phi);

hold on
quiver (x, y, rhox, rhoy, 0.5)
quiver (x, y, phix, phiy, 0.5)
scatter(x, y,'filled');

title('Cylindrical Coordinates')
xlabel('x, m')
xlim([-3, 3])
ylabel('y, m')
ylim([-3, 3])
legend('\rho', '\phi')
axis square
hold off
```

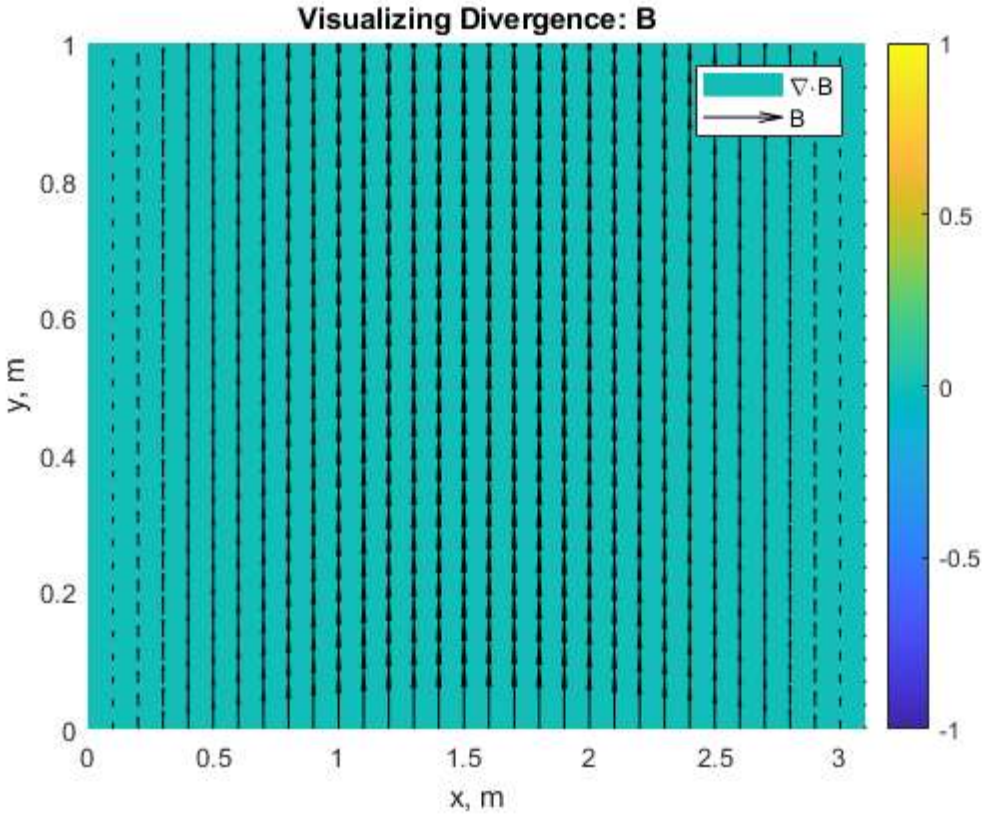


Visualizing Divergence

```
x = linspace(0, 3.1, 32);
y = linspace(0, 1, 31);
[X, Y] = meshgrid(x, y);

A  = sin(X); %xcomp
dA = cos(X); %dA/dx

B  = A;      %ycomp
```

```
dB = 0*Y;    %dB/dy

figure
hold on
p = pcolor(X ,Y, dA);
set(p, 'EdgeColor', 'none');
cbh = colorbar;
cbh.Ticks = linspace(-1, 1, 5);
quiver(X, Y, A, 0*X,'black');

title('Visualizing Divergence: A')
ylabel('y, m')
xlabel('x, m')
xlim([0,3.1])
ylim([0,1])
yticks(0:(1/5):1)
legend('\nabla\cdotA', 'A')
hold off

figure
hold on
pcolor(X ,Y, dB);
shading flat

cbh = colorbar;
cbh.Ticks = linspace(-1, 1, 5);
quiver(X, Y, 0*X, B,'black');

title('Visualizing Divergence: B')
ylabel('y, m')
xlabel('x, m')
xlim([0,3.1])
ylim([0,1])
yticks(0: .2 :1)
legend('\nabla\cdotB', 'B')
```





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