#### l Center text

\$\centerline{Derive circle parametric equation}\$

#### Derive circle parametric equation

## 2 Greek Symbols

$\alpha$	$\theta$	au	β
$\vartheta$	$\pi$	v	$\gamma$
$\varpi$	$\phi$	δ	$\kappa$
$\rho$	$\varphi$	$\epsilon$	λ
Q	χ	ε	$\mu$
$\sigma$	$\psi$	ζ	$\nu$
ς	$\omega$	$\eta$	ξ
Γ	Λ	Σ	Ψ
Δ	Υ	Ω	Θ
П	Φ	0	1

\frac{\partial u}{\partial x} = h^2 \left( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right)

$$\frac{\partial u}{\partial x} = h^2 \left( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right)$$

#### 3 Table

#### 3.1 Tabular

1							
	2						
		9					
			0				
				1			
					10		
						2	
							4
							_

```
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline
\textcolor{red}{1} & 2 & 9 & 0 & 1 & 10 & 2 & 4 \\ hline
1 & \textcolor{red}{2} & 9 & 0 & 1 & 10 & 2 & 4 \\ hline
1 & 2 & \textcolor{red}{9} & 0 & 1 & 10 & 2 & 4 \\ hline
1 & 2 & 9 & \textcolor{red}{9} & 0 & 1 & 10 & 2 & 4 \\ hline
1 & 2 & 9 & \textcolor{red}{0} & 1 & 10 & 2 & 4 \\ hline
1 & 2 & 9 & 0 & \textcolor{red}{1} & 10 & 2 & 4 \\ hline
1 & 2 & 9 & 0 & 1 & \textcolor{red}{1} & 10 & 2 & 4 \\ hline
1 & 2 & 9 & 0 & 1 & \textcolor{red}{1} & 10 & 2 & 4 \\ hline
1 & 2 & 9 & 0 & 1 & 10 & \textcolor{red}{2} & 4 \\ hline
1 & 2 & 9 & 0 & 1 & 10 & 2 & \textcolor{red}{4} \\ hline
\end{tabular}
```

(2, 3) (otimes (4, 5) - (miderbrace(2(1, 0) + 3(0, 1))\_{liftst} (otimes (miderbrace( 4(1, 0) + 3(0, 1))\_{secondr

$$f(n) = \begin{cases} n/2 & \text{if } n \text{ is even} \\ n+1 & \text{if } n \text{ is odd} \end{cases}$$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

A= \begin{bmatrix}
1 & 2 & 3\\
4 & 5 & 6\\
7 & 8 & 9
\end{bmatrix}

$$A = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$$

A= \left| \begin{array}{ccc}
1 & 2 & 3\\
4 & 5 & 6\\
7 & 8 & 9
\end{array} \right|

```
A= \begin{matrix}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9
\end{matrix}
```

```
&\left[\begin{array}{ccc|c}
1 & 2 & 3 & 1\\
4 & 5 & 6 & 2\\
7 & 8 & 10 & 5\\
\end{array}\right]
```

```
    d
    a
    t
    e

    c
    a
    a
    a
    a

    n
    a
    a
    a
    a

    d
    a
    a
    a
    a

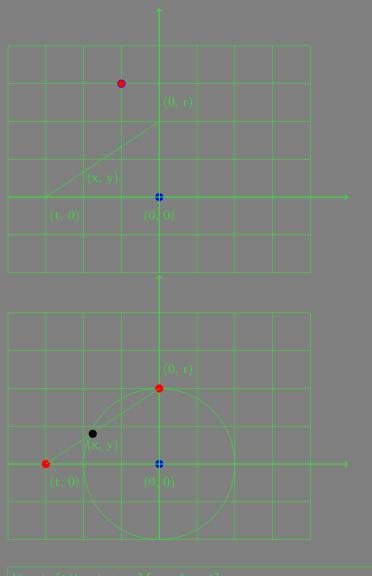
    d
    a
    a
    a
    a

    t
    a
    a
    a
    a

    e
    a
    a
    a
    a
```

```
\begin{array}(|c|c|c|c|c|)
\hline
& d & a & t & e \\ \hline
c & & & & \\ \hline
a & & & & \\ \hline
n & & & & \\ \hline
d & & & & \\ \hline
i & & & & \\ \hline
d & 1& & & \\ \hline
e & & & & \\ \hline
t & & & & & \\ \hline
e & & & & & \\ \hline
e & & & & & & \\ \hline
e & & & & & & \\ \hline
e & & & & & & \\ \hline
```

$$A = \frac{1}{7} \quad \frac{2}{8}$$



```
% 4xd grid
\draw (-2, 0) grid (6, 6);
% origin point
\draw [color=blue, fill=blue] (2, 4) circle (0.1);
% x-axis
\draw [thick,->] (-2, 4) -- (7, 4);
% y-axis
\draw [thick,->] (2, 6) -- (2, -1);
% origin label
\rode at (2, 4, 5) ((0, 0));
\draw (2, 4) circle (2);
\draw [color=red, fill=red] (2, 2) circle(0.1);
\rode at (2.5, 1.5)((0, r));
\draw [color=red, fill=red] (-1, 4) circle(0.1);
\node at (-0.5, 4.5)((r, 0));
\draw (2, 2)--(-1, 4);
\node at (0.5, 3.5)f(x, y);
\draw [color=black, fill=black] (0.24, 3.2) circle(0.1);
\end(tikzpicture)\\ \\
```

Rotate a line around a point in degree

(x, y)

(0, 0)

## 4 Small Subscript

```
https://tex.stackexchange.com/questions/262295/make-subscript-size-smaller-always
\documentclass{article}
\catcode'_=\active
\newcommand_[1]{\ensuremath{\sb{\scriptscriptstyle #1}}}
Original: $A_{\scriptstyle 1}^2$ \\
new: $A_{\scriptscriptstyle 1}^2$ \\
```

```
Original: A_1^2 new: A_1^2
```

### 5 Matrix dots

$$L_k = l + v_k e_k^* = egin{bmatrix} 1 & & & & & \\ & \ddots & & & & \\ & & l_{k+1,k} & & \\ & & \vdots & \ddots & \\ & & l_{m,k} & & 1 \end{bmatrix}$$

# 6 Change the width and height of a page

```
%
\usepackage{geometry}
\geometry(paperwidth=18cm, paperheight=80cm)
```

## 7 Text in Math Mode

```
x+y=z x+y=z \text{\begin{align*} x + y &= z \\ \text{\constant} \}
```

```
x + y &= z \setminus \{x + y = z\} where is x + y = z
```

```
\begin{align*}
    x + y &= z \\
    x + y &= z \tag{ Where is $x$} \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + v &= z
```

```
x + y = z

x + y = z Where is x = 1

x + y = z

x + u = z
```

```
\begin{align*}
    x + y &= z \\
    x + y &= z \quad \mbox{ Where is $x = 1$} \\
    x + y &= z \\
   x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
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    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
    x + y &= z \\
```

$$x + y = z$$

$$a + b = c$$
(

```
\begin{align}
    x + y &= z \\
    a + b &= c
\end{align}
```

```
+y=z
+b=c
```

```
% aligned is not a math mode
\begin{equation}
\begin{aligned}
    x + y &= z \\
    a + b &= c
\end{aligned}
\end{equation}
```

### 8 Math mode inside verbatim

```
abc \alpha, \beta, \phi
```

The limit of function

$$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

#### 9 Set

```
\{1,2,3,\dots\}
\{x\mid x<3 \text{ and } x>10\}
\mathcal{A}=\cup(U_{\alpha},\phi_{\alpha})
```

```
$\emptyset \quad \cap \quad \cup \quad \mid \subset \subseteq$ \\
$\{1, 2, 3, \dots \}$ \\
$\{ x \mid x < 3 \mbox{ and } x > 10 \}$ \\
$\mathcal{A} = \cup (U_{\alpha}, \phi_{\alpha})$
```

- C++
- Java
- Haskel

```
\begin{itemize}
\item C++
\item Java
\item Haskell
\end{itemize}
```

- 1 C + +
- 2. Java
- 3 Haskell

```
\begin{enumerate}
\item C++
\item Java
\item Haskell
\end{itemize}
```

### 10 Sphere Paremetric Equation

```
x = r \sin \alpha \cos \theta
y = r \sin \alpha
z = r \cos \alpha \sin \theta
(4)
```

```
begin(equation)
begin(aligned)

x &= r \sin \alpha \cos \theta \\
y &= r \sin \alpha

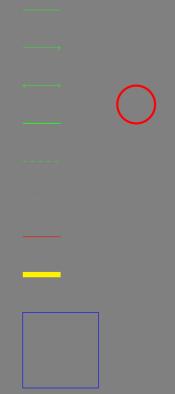
z &= r \cos \alpha \sin \theta \\
end(aligned)
\end(equation) \\
```

### 11 Equataion Cases

$$f(\alpha, \theta) = \begin{cases} x(\alpha, \theta) = r \sin \alpha \cos \theta \\ y(\alpha, \theta) = r \sin \alpha \\ z(\alpha, \theta) = r \cos \alpha \sin \theta \end{cases}$$
 (5)

## 12 Tikz Example

Draw Line



```
\draw (0,3,0) -- (1,3,0);
\draw [->] (0,2,0) -- (1,2,0);
\draw [(->] (0,1,0) -- (1,1,0);
\draw [thick] (0,0,0) -- (1,0,0);
\draw [dashed] (0,-1,0) -- (1,-1,0);
\draw [dotted] (0,-2,0) -- (1,-2,0);
\draw [red] (0,-3,0) -- (1,-3,0);
\draw [yellow, line width=4] (0,-4,0) -- (1,-4,0);
\draw [blue] (0, -5) rectangle (2, -7);
\draw [red, ultra thick] (3,0.5) circle [radius=0.5];
\draw [gray] (6,0) arc [radius=1, start angle=45, end angle= 120];
```

## 13 Draw Circle from degree, for loop



```
\begin{tikzpicture}
    \draw[red] (0, 0) circle[radius=1cm];
    \foreach \i in {0, 60, 120, 180, 240, 300} {
        \draw (0, 0) -- (\i: 1);
        \fill (\i: 1) circle[radius=0.1cm];
    }
\end{tikzpicture}
```

### 14 Draw Grid



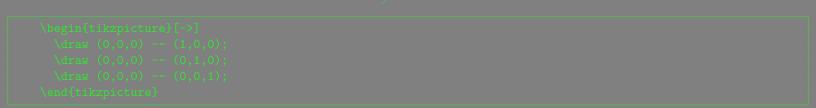
```
\tikz{
  \draw (0, 0) grid[step=0.5] (2, 2);
  \draw (0, 0) circle [radius=0.1];
}
```

### 15 Draw Grid with text



```
\tikz{
  \draw (0, 0) grid[step=0.5] (2, 2);
  \node (text) at (0.25, 0.25) {A}
  \draw (0, 0) circle [radius=0.1];
}
```

## 16 Cartesian Coordinates System



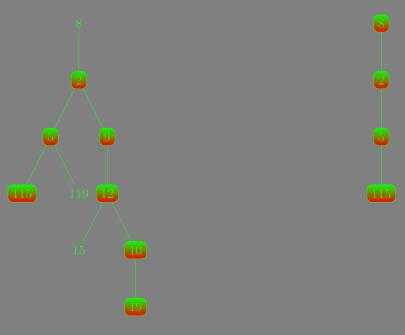
# 17 Draw Triangle, label end point



```
\begin{tikzpicture}
  \draw (0,0) -- (1,1);
  \draw (0,0) -- (1,0);
  \draw (1,1) -- (1,0);
  \draw [left=1pt](0,0) node {A};
```

```
\draw [above=1pt](1,1) node {B};
\draw [below=1pt](1,0) node {C};
\end{tikzpicture}
```

## 18 Binary Tree With Color, side by side



```
| begin{forest}
for tree={circle,draw, 1 sep=10pt}
[$\alpha$,red
[1
[2]
[3]
[3]
]
[2
(4]
[9]
]
| begin{forest}
| contact | con
```



### 19 Text left alignment in an array

## 19.1 array environment DOES NOT switch to math mode automatically

center1	
e	

```
{
  \begin{array}{|||c|r|} \hline
  left1 & $\tc{red}{center1}$ & right1 \\ \hline
  d & $\tc{red}{e}$ & f \\ \hline
  \end{array} \\ \\
}
```

#### 19.2 array environment has math symbol

```
\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix}
```

```
% array in math environment
\[
  \begin{array}{|||c|r|} \hline
    a_{11} & a_{12} & a_{13} \ hline
    a_{21} & a_{22} & a_{23} \ \hline
    \end{array} \\ \\
]
```

center1	
e	

```
\[ \begin{array}{|||c|r|} \hline \\ left1 & \\tc{red}{center1} & right1 \\ \hline \\ d & \\tc{red}{e} & & f \\ \hline \\end{array} \\ \\ ]
```

```
\begin{array}{|l|c|r|} \hline
left1 & $\tc{red}{center1}$ & right1 \\ \hlin
d & $\tc{red}{e}$ & f \\ \hlin
\end{array} \\ \\
```

```
\begin{array}{||||r||} \hline
left1 & $\tc{pink}{center1}$ & right1 \\ \hline
d & $\tc{pink}{e}$ & f \\ \hline
\end{array}
```

### 20 Box around equation

$$y = x + z$$
$$x = y - z$$

```
\usepackage(mathtools)
\begin(equation+)
  \begin(aligned)
    y &= x + z \\
    \Aboxed(x &= y - z) \\
    \end(aligned)
\end(equation*)
```

### 21 Binomial

$$(a+b)^n = \binom{n}{k} a^k b^{n-k} = \frac{n!}{(n-k)!k!} a^k b^{n-k}$$

```
\[ (a + b)^{n} = \binom n k a^{k} b^{n-k} = \frac{n!}{(n-k)! k!} a^k b^{n-k} \]
```

### 22 Better theorem

Theorem 2.0 (My Title). Eistein Theorem.

$$E = mc^2$$

c is the speed of ligh m is the mass E is the energy