

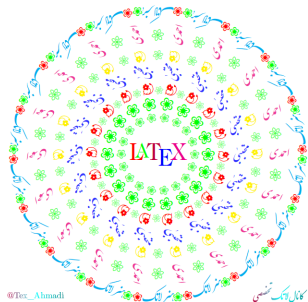


☆ رسم گراف با استفاده از بسته tikz ☆

مجتبی احمدی

پیام نور مشگین شهر

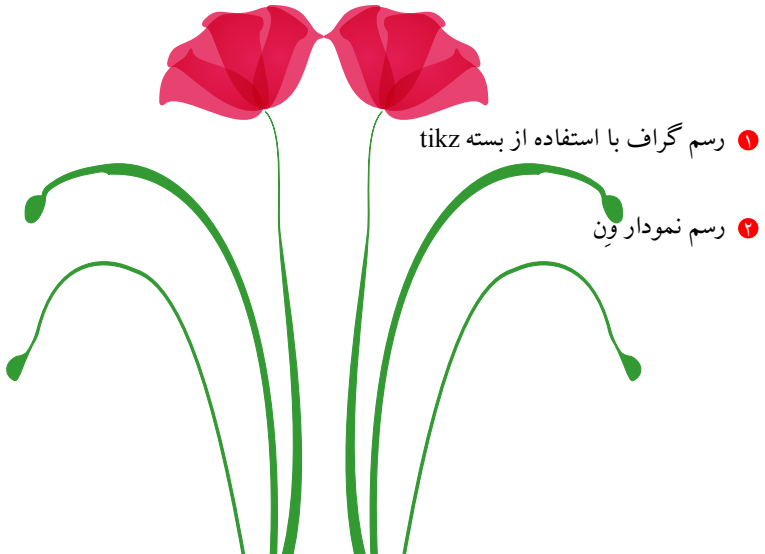
۱۹ فروردین ۱۴۰۱



@Tex_Ahmadi

کمال کامبختی

فهرست مطالب



رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex (a) at (0,0) [] {};
\vertex (b) at (2,0) [] {};
\end{tikzpicture}
```



برای رسم رأس‌هایی دایره‌ای دستوری به نام vertex تعریف کردیم. کد فوق را داخل محیط center کد زیر قرار دهید.

```
\documentclass{report}
\usepackage{tikz}
\tikzset{vertex/.style={circle,draw,inner sep=0pt,minimum size=5pt}}
\newcommand{\vertex}{\node[vertex]}

\begin{document}
\begin{center}

\end{center}

\end{document}
```

رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex (a) at (0,0) [] {$a_1$};
\vertex (b) at (2,0) [] {$a_2$};
\end{tikzpicture}
```

 a_1 a_2

دستور

```
\vertex (a) at (0,0) [] {$a_1$};
```

یک رأس دایره‌ای در نقطه $(0, 0)$ که داخل دایره a_1 قرار می‌دهد.

رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex (a) at (0,0) [] {$a_1$};
\vertex (b) at (2,0) [] {$a_2$};
\path
(a) edge (b);
\end{tikzpicture}
```



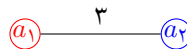
در دستور

```
\path (a) edge (b);
```

برای اینکه مختصات رأس رو دوباره ننویسم آنها رو نامگذاری کردیم مثلاً رأسی که در نقطه $(0, 0)$ قرار دارد را با (a) و رأسی که در نقطه $(2, 0)$ قرار دارد (b) گذاشتیم، حال برای وصل کردن یال $(edge)$ دو رأس از دستور `\path` استفاده می‌کنیم.

رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex (a) at (0,0) [red] {$a_1$};
\vertex (b) at (2,0) [blue] {$a_2$};
\path
(a) edge node[pos=0.5,above]{\small $3$}
(b);
\end{tikzpicture}
```



در دستور

```
\path (a) edge node[pos=0.5,above]{\small $3$} (b);
```

برچسب ۳ در بالای وسط یال، (pos=0.5) قرار می‌دهد.

توجه: برای قرار گرفتن برچسب یال مقدار pos را بین صفر و یک انتخاب می‌کنیم. اگر مقدار کمتر از صفر یا بیشتر از یک قرار داده شود، روی یال قرار نخواهد گرفت.

توجه: می‌توان بجای pos=0.5، **midway** قرار داد.

رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex (a) at (0,0) [red] {$a_1$};
\vertex (b) at (2,0) [blue] {$a_2$};
\path
(a) edge[blue,->] (b);
\end{tikzpicture}
```



در دستور

```
\path (a) edge[blue,->] (b);
```

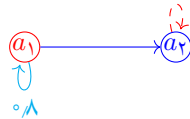
برای رسم یال جهتدار آپشن یال را \rightarrow قرار دادیم.
واضح هست که آپشن یال blue رنگ آبی می باشد.

رسم گراف با رأس دایره:

```

\begin{tikzpicture}
\vertex (a) at (0,0) [red] {$a_1$};
\vertex (b) at (2,0) [blue] {$a_2$};
\path
(a) edge[blue,->] (b)
(b) edge[red,loop above,dashed] (b)
(a) edge[cyan,loop below] node {\small
    $0.8$} (a);
\end{tikzpicture}

```



برای قرار دادن طوقه از آپشن loop استفاده می‌کنیم.

```

\path (b) edge [red,loop above,dashed] (b);

```


رسم گراف با رأس دایره:

```

\begin{tikzpicture}
\vertex (a) at (0,0) [red] {$a_1$};
\vertex (b) at (2,0) [blue] {$a_2$};
\path
(a) edge[red,bend right] (b)
(a) edge[blue,bend left,dashed] (b);
\end{tikzpicture}

```



برای قرار دادن یال کماندار از آپشن bend استفاده می‌کنیم.

رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex (a) at (0,0) [red] {$a_1$};
\vertex (b) at (2,0) [blue] {$a_2$};
\path
(a) edge[red,bend right,<-] (b)
(a) edge[blue,bend left,dashed,->] (b);
\end{tikzpicture}
```



رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex [fill] (a) at (0,0) [] {};
\vertex [fill] (b) at (2,0) [] {};
\end{tikzpicture}
```



برای رأس توپر آپشن دستور `\vertex` را `fill` قرار می‌دهیم.

رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex [fill] (a) at (0,0) [label=left
:$a_{1}$] {};
\vertex [fill] (b) at (2,0) [label=right
:$a_{2}$] {};
\end{tikzpicture}
```

 $a_1 \bullet \qquad \bullet a_2$

برای نامگذاری رأس در آپشن دستور `\vertex` را `label=?` قرار می دهیم.

رسم گراف با رأس دایره:

```

\begin{tikzpicture}
\vertex [fill] (a) at (0,0) [label=left
:{$a_1$}] {};
\vertex [fill] (b) at (2,0) [label=right
:{$a_2$}] {};
\path
(a) edge (b);
\end{tikzpicture}

```

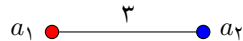


رسم گراف با رأس دایره:

```

\begin{tikzpicture}
\vertex [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertex [fill=blue] (b) at (2,0) [label=
right:$a_{2}$] {};
\path
(a) edge node[pos=0.5,above]{\small $3$}
(b);
\end{tikzpicture}

```



رسم گراف با رأس دایره:

```

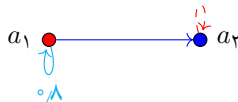
\begin{tikzpicture}
\vertex [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertex [fill=blue] (b) at (2,0) [label=
right:$a_{2}$] {};
\path
(a) edge[blue,->] (b);
\end{tikzpicture}

```



رسم گراف با رأس دایره:

```
\begin{tikzpicture}
\vertex [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertex [fill=blue] (b) at (2,0) [label=
right:$a_{2}$] {};
\path
(a) edge[blue,->] (b)
(b) edge[red,loop above,dashed] (b)
(a) edge[cyan,loop below] node {\small
$0.8$} (a);
\end{tikzpicture}
```



رسم گراف با رأس دایره:

```

\begin{tikzpicture}
\vertex [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertex [fill=blue] (b) at (2,0) [label=
right:$a_{2}$] {};
\path
(a) edge[red,bend right] (b)
(a) edge[blue,bend left,dashed] (b);
\end{tikzpicture}

```



رسم گراف با رأس دایره:

```

\begin{tikzpicture}
\vertex [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertex [fill=blue] (b) at (2,0) [label=
right:$a_{2}$] {};
\path
(a) edge[red,bend right,<-] (b)
(a) edge[blue,bend left,dashed,->] (b);
\end{tikzpicture}

```



رسم گراف با رأس مربع:

```
\begin{tikzpicture}
\vertexs (a) at (0,0) [] {};
\vertexs (b) at (2,0) [] {};
\end{tikzpicture}
```



برای رسم رأس‌هایی مربعی دستوری به نام `vertexs` تعریف کردیم. کد فوق را داخل محیط `center` کد زیر قرار دهید.

```
\documentclass{report}
\usepackage{tikz}
\tikzset{vertexs/.style={draw,minimum width=.2cm,minimum height=.2cm}}
\newcommand{\vertexs}{\node[vertexs]}

\begin{document}
\begin{center}

\end{center}
\end{document}
```

رسم گراف با رأس مربع:

```
\begin{tikzpicture}
\vertexs (a) at (0,0) [] {$a_{1}$};
\vertexs (b) at (2,0) [] {$a_{2}$};
\end{tikzpicture}
```

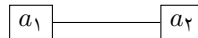
 a_1 a_2

رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertexs (a) at (0,0) [] {${a}_1$};
\vertexs (b) at (2,0) [] {${a}_2$};
\path
(a) edge (b);
\end{tikzpicture}

```

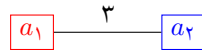


رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertexs (a) at (0,0) [red] {$a_1$};
\vertexs (b) at (2,0) [blue] {$a_2$};
\path
(a) edge node[pos=0.5,above]{\small $3$}
(b);
\end{tikzpicture}

```



دستورهای معادل پیش فرض عبارتند از:

very near start	≡	pos = ۰٫۱۲۵
near start	≡	pos = ۰٫۲۵
midway	≡	pos = ۰٫۵
near end	≡	pos = ۰٫۷۵
very near end	≡	pos = ۰٫۸۷۵

رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertexs (a) at (0,0) [red] {$a_1$};
\vertexs (b) at (2,0) [blue] {$a_2$};
\path
(a) edge[blue,->] (b);
\end{tikzpicture}

```

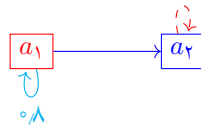


رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertexs (a) at (0,0) [red] {$a_1$};
\vertexs (b) at (2,0) [blue] {$a_2$};
\path
(a) edge[blue,->] (b)
(b) edge[red,loop above,dashed] (b)
(a) edge[cyan,loop below] node {\small
    $0.8$} (a);
\end{tikzpicture}

```



رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertexs (a) at (0,0) [red] {$a_{1}$};
\vertexs (b) at (2,0) [blue] {$a_{2}$};
\path
(a) edge[red,bend right] (b)
(a) edge[blue,bend left,dashed] (b);
\end{tikzpicture}

```



رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertexs (a) at (0,0) [red] {$a_1$};
\vertexs (b) at (2,0) [blue] {$a_2$};
\path
(a) edge[red,bend right,<-] (b)
(a) edge[blue,bend left,dashed,->] (b);
\end{tikzpicture}

```



رسم گراف با رأس مربع:

```
\begin{tikzpicture}
\vertices [fill] (a) at (0,0) [] {};
\vertices [fill] (b) at (2,0) [] {};
\end{tikzpicture}
```



رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertices [fill] (a) at (0,0) [label=left
:$a_{1}$] {};
\vertices [fill] (b) at (2,0) [label=
right:$a_{2}$] {};
\end{tikzpicture}

```

 a_1 ■ a_2

رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertices [fill] (a) at (0,0) [label=left
:$a_{1}$] {};
\vertices [fill] (b) at (2,0) [label=
right:$a_{2}$] {};
\path
(a) edge (b);
\end{tikzpicture}

```

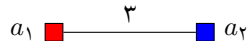


رسم گراف با رأس مربع:

```

\begin{tikzpicture}
\vertices [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertices [fill=blue] (b) at (2,0) [label
=right:$a_{2}$] {};
\path
(a) edge node[pos=0.5,above]{\small $3$}
(b);
\end{tikzpicture}

```



رسم گراف با رأس مربع:

```

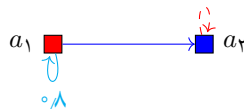
\begin{tikzpicture}
\vertices [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertices [fill=blue] (b) at (2,0) [label
=right:$a_{2}$] {};
\path
(a) edge[blue,->] (b);
\end{tikzpicture}

```



رسم گراف با رأس مربع:

```
\begin{tikzpicture}
\vertices [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertices [fill=blue] (b) at (2,0) [label
=right:$a_{2}$] {};
\path
(a) edge[blue,->] (b)
(b) edge[red,loop above,dashed] (b)
(a) edge[cyan,loop below] node {\small
$0.8$} (a);
\end{tikzpicture}
```



رسم گراف با رأس مربع:

```
\begin{tikzpicture}
\vertices [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertices [fill=blue] (b) at (2,0) [label
=right:$a_{2}$] {};
\path
(a) edge[red,bend right] (b)
(a) edge[blue,bend left,dashed] (b);
\end{tikzpicture}
```



رسم گراف با رأس مربع:

```
\begin{tikzpicture}
\vertices [fill=red] (a) at (0,0) [label=
left:$a_{1}$] {};
\vertices [fill=blue] (b) at (2,0) [label
=right:$a_{2}$] {};
\path
(a) edge[red,bend right,<-] (b)
(a) edge[blue,bend left,dashed,->] (b);
\end{tikzpicture}
```

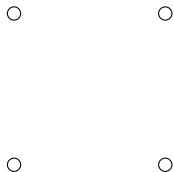


رسم گراف:

```

\begin{tikzpicture}
\vertex (a) at (0,0) [] {};
\vertex (b) at (2,0) [] {};
\vertex (c) at (2,2) [] {};
\vertex (d) at (0,2) [] {};
\end{tikzpicture}

```



رسم گراف:

```

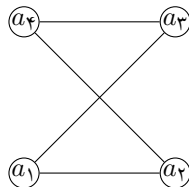
\begin{tikzpicture}
\vertex (a) at (0,0) [] {$a_{1}$};
\vertex (b) at (2,0) [] {$a_{2}$};
\vertex (c) at (2,2) [] {$a_{3}$};
\vertex (d) at (0,2) [] {$a_{4}$};
\end{tikzpicture}

```

 a_4 a_3 a_1 a_2

رسم گراف:

```
\begin{tikzpicture}
\vertex (a) at (0,0) [] {$a_1$};
\vertex (b) at (2,0) [] {$a_2$};
\vertex (c) at (2,2) [] {$a_3$};
\vertex (d) at (0,2) [] {$a_4$};
\path
(a) edge (b)
(a) edge (c)
(b) edge (d)
(c) edge (d)
;
\end{tikzpicture}
```

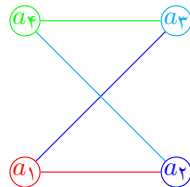


رسم گراف:

```

\begin{tikzpicture}
\vertex (a) at (0,0) [red] {$a_1$};
\vertex (b) at (2,0) [blue] {$a_2$};
\vertex (c) at (2,2) [cyan] {$a_3$};
\vertex (d) at (0,2) [green] {$a_4$};
\path
(a) edge[red] (b)
(a) edge[blue] (c)
(b) edge[cyan] (d)
(c) edge[green] (d)
;
\end{tikzpicture}

```

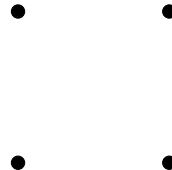


رسم گراف:

```

\begin{tikzpicture}
\vertex[fill] (a) at (0,0) [] {};
\vertex[fill] (b) at (2,0) [] {};
\vertex[fill] (c) at (2,2) [] {};
\vertex[fill] (d) at (0,2) [] {};
\end{tikzpicture}

```



رسم گراف:

```
\begin{tikzpicture}
\vertex[fill] (a) at (0,0) [label=left:$
a_{1}$] {};
\vertex[fill] (b) at (2,0) [label=right
:$a_{2}$] {};
\vertex[fill] (c) at (2,2) [label=right
:$a_{3}$] {};
\vertex[fill] (d) at (0,2) [label=left:$
a_{4}$] {};
\end{tikzpicture}
```

a_4 ●

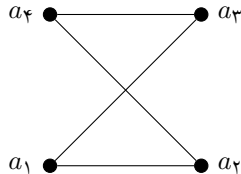
● a_3

a_1 ●

● a_2

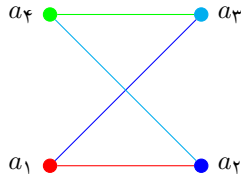
رسم گراف:

```
\begin{tikzpicture}
\vertex[fill] (a) at (0,0) [label=left:$
a_{1}$] {};
\vertex[fill] (b) at (2,0) [label=right
:$a_{2}$] {};
\vertex[fill] (c) at (2,2) [label=right
:$a_{3}$] {};
\vertex[fill] (d) at (0,2) [label=left:$
a_{4}$] {};
\path
(a) edge (b)
(a) edge (c)
(b) edge (d)
(c) edge (d);
\end{tikzpicture}
```

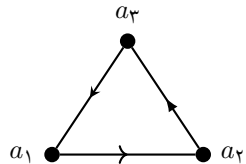


رسم گراف:

```
\begin{tikzpicture}
\vertex[fill=red] (a) at (0,0) [red,
  label=left:$a_{1}$] {};
\vertex[fill=blue] (b) at (2,0) [blue,
  label=right:$a_{2}$] {};
\vertex[fill=cyan] (c) at (2,2) [cyan,
  label=right:$a_{3}$] {};
\vertex[fill=green] (d) at (0,2) [green,
  label=left:$a_{4}$] {};
\path
(a) edge[red] (b)
(a) edge[blue] (c)
(b) edge[cyan] (d)
(c) edge[green] (d);
\end{tikzpicture}
```



```
\begin{tikzpicture}[thick]
\vertex[fill] (a) at (0,0) [label=left:$a_{1}$]
{};
\vertex[fill] (b) at (2,0) [label=right:$a_{2}$]
{};
\vertex[fill] (c) at (1,1.5) [label=above:$a_{3}$]
{};
\path
(a) edge [middlearrow={>}] (b)
(b) edge [middlearrow={latex}] (c)
(c) edge [middlearrow={stealth}] (a);
\end{tikzpicture}
```

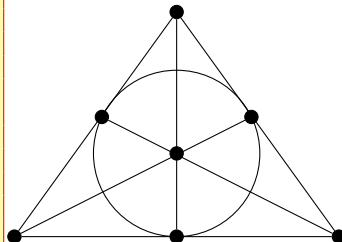


در کد زیر قرار دهید:

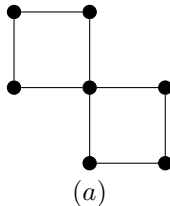
```
\documentclass[12pt,a4paper]{report}
\usepackage{tikz}
\tikzstyle{vertex}=[circle,draw,inner sep=0pt,minimum size=5pt]
\newcommand{\vertex}{\node[vertex]}
\usetikzlibrary{decorations.markings}
\tikzset{middlearrow/.style={decoration={markings,mark=at position 0.5 with{\arrow{#1}}},postaction={decorate}}}
\begin{document}
\begin{center}

\end{center}
\end{document}
```

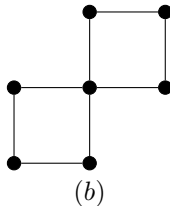
```
\begin{tikzpicture}[scale=1.2]
\draw (0,0) circle (1);
\vertex [fill] (a) at (0:0) [] {};
\vertex [fill] (b) at (26:1) [] {};
\vertex [fill] (c) at (154:1) [] {};
\vertex [fill] (d) at (270:1) [] {};
\vertex [fill] (e) at (-1.95,-1) [] {};
\vertex [fill] (f) at (1.95,-1) [] {};
\vertex [fill] (g) at (0,1.7) [] {};
\path
(e) edge (f)
(e) edge (b)
(e) edge (g)
(f) edge (g)
(f) edge (c)
(g) edge (d);
\end{tikzpicture}
```



```
\begin{tikzpicture}[scale=1]
\vertex[fill] (b) at (0,1) {};
\vertex[fill] (c) at (0,2) {};
\vertex[fill] (f) at (1,0) [label=below:$(a)$] {};
\vertex[fill] (e) at (1,1) {};
\vertex[fill] (d) at (1,2) {};
\vertex[fill] (i) at (2,0) {};
\vertex[fill] (h) at (2,1) {};
\path
(b) edge (c)
(b) edge (e)
(c) edge (d)
(d) edge (e)
(e) edge (f)
(e) edge (h)
(i) edge (f)
(i) edge (h);
\end{tikzpicture}
```



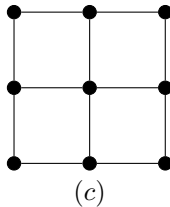
```
\begin{tikzpicture}[scale=1]
\vertex[fill] (a) at (0,0) [] {};
\vertex[fill] (b) at (0,1) [] {};
\vertex[fill] (f) at (1,0) [label=below:$(b)$] {};
\vertex[fill] (e) at (1,1) [] {};
\vertex[fill] (d) at (1,2) [] {};
\vertex[fill] (h) at (2,1) [] {};
\vertex[fill] (g) at (2,2) [] {};
\path
(a) edge (b)
(a) edge (f)
(b) edge (e)
(d) edge (e)
(e) edge (f)
(e) edge (h)
(d) edge (g)
(h) edge (g);
\end{tikzpicture}
```



```

\begin{tikzpicture}[scale=1]
\vertex[fill] (a) at (0,0) [] {};
\vertex[fill] (b) at (0,1) [] {};
\vertex[fill] (c) at (0,2) [] {};
\vertex[fill] (f) at (1,0) [label=below:$(c)$] {};
\vertex[fill] (e) at (1,1) [] {};
\vertex[fill] (d) at (1,2) [] {};
\vertex[fill] (i) at (2,0) [] {};
\vertex[fill] (h) at (2,1) [] {};
\vertex[fill] (g) at (2,2) [] {};
\path
(a) edge (b)
(a) edge (f)
(b) edge (c)
(b) edge (e)
(c) edge (d)
(d) edge (e)
(e) edge (f)
(e) edge (h)
(d) edge (g)
(i) edge (f)
(i) edge (h)
(h) edge (g);
\end{tikzpicture}

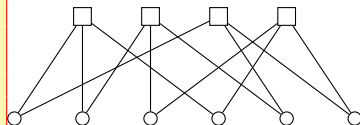
```



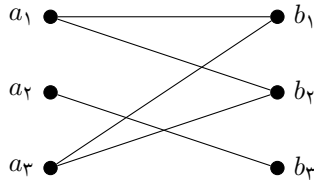
```

\begin{tikzpicture}
\vertexs (a1) at (0,0) []{};
\vertexs (a2) at (1,0) []{};
\vertexs (a3) at (2,0) []{};
\vertexs (a4) at (3,0) []{};
\vertex (b1) at (-1,-1.5) []{};
\vertex (b2) at (0,-1.5) []{};
\vertex (b3) at (1,-1.5) []{};
\vertex (b4) at (2,-1.5) []{};
\vertex (b5) at (3,-1.5) []{};
\vertex (b6) at (4,-1.5) []{};
\path
(a1) edge (b1)
(a1) edge (b2)
(a1) edge (b4)
(a2) edge (b2)
(a2) edge (b3)
(a2) edge (b5)
(a3) edge (b1)
(a3) edge (b5)
(a3) edge (b6)
(a4) edge (b3)
(a4) edge (b4)
(a4) edge (b6);
\end{tikzpicture}

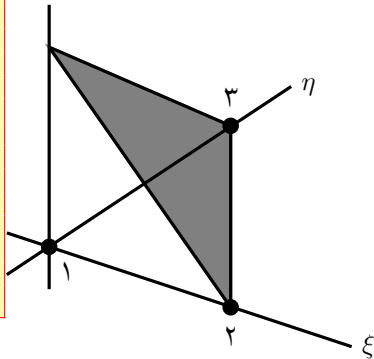
```



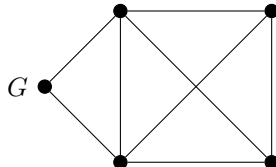

```
\begin{tikzpicture} [scale=1.5]
\vertex[fill] (a3) at (0,0) [label=left:$a_{3}$]
{};
\vertex[fill] (a2) at (0,1) [label=left:$a_{2}$]
{};
\vertex[fill] (a1) at (0,2) [label=left:$a_{1}$]
{};
\vertex[fill] (b3) at (3,0) [label=right:$b_{3}$]
{};
\vertex[fill] (b2) at (3,1) [label=right:$b_{2}$]
{};
\vertex[fill] (b1) at (3,2) [label=right:$b_{1}$]
{};
\path
(a1) edge (b1)
(a1) edge (b2)
(a2) edge (b3)
(a3) edge (b1)
(a3) edge (b2);
\end{tikzpicture}
```



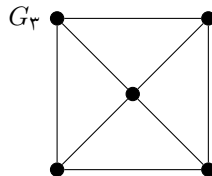
```
\begin{tikzpicture}[scale=0.8,very thick]
\filldraw [black!50](0,3.3)--(3,2)--(3,-1)--cycle;
\vertex[fill] (a3) at (0,0) [] {};
\vertex[fill] (a1) at (3,-1) [label=below:$2$] {};
\vertex[fill] (a2) at (3,2) [label=above:$3$] {};
\draw(-.7,.23)--(0,0) -- (5,-1.65) node[right]
{$\xi$};
\draw(-.7,-.46) -- (4,2.65) node[right] {$\eta$};
\draw(0,-.7)--(0,-.4) node[right] {$1$} -- (0,4);
\draw(3,-1)--(3,2);
\draw(3,2)--(0,3.3);
\draw(0,3.3)--(3,-1);
\end{tikzpicture}
```



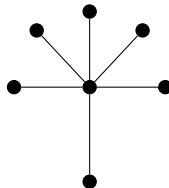
```
\begin{tikzpicture}
\vertex[fill] (u1) at (1,0) [] {};
\vertex[fill] (u2) at (0,1) [label=left:$G$] {};
\vertex[fill] (u3) at (1,2) [] {};
\vertex[fill] (u4) at (3,0) [] {};
\vertex[fill] (u5) at (3,2) [] {};
\path
(u1) edge (u2)
(u1) edge (u3)
(u1) edge (u4)
(u1) edge (u5)
(u3) edge (u2)
(u3) edge (u4)
(u3) edge (u5)
(u4) edge (u5);
\end{tikzpicture}
```



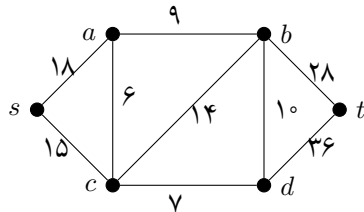
```
\begin{tikzpicture}
\vertex[fill] (u1) at (0,0) [] {};
\vertex[fill] (u2) at (2,0) [] {};
\vertex[fill] (u3) at (1,1) [] {};
\vertex[fill] (u4) at (0,2) [label=left:$G_{\{3\}}$]
    {};
\vertex[fill] (u5) at (2,2) [] {};
\path
(u1) edge (u2)
(u1) edge (u3)
(u1) edge (u4)
(u3) edge (u4)
(u3) edge (u5)
(u2) edge (u5)
(u5) edge (u4);
\end{tikzpicture}
```



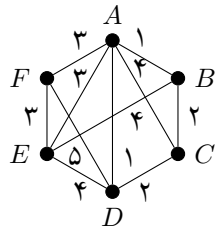
```
\begin{tikzpicture}
\vertex[fill] (u1) at (1,0) [] {};
\vertex[fill] (u2) at (0,1.25) [] {};
\vertex[fill] (u3) at (1,1.25) [] {};
\vertex[fill] (u4) at (2,1.25) [] {};
\vertex[fill] (u5) at (.3,2) [] {};
\vertex[fill] (u6) at (1,2.25) [] {};
\vertex[fill] (u7) at (1.7,2) [] {};
\path
(u1) edge (u3)
(u3) edge (u2)
(u3) edge (u4)
(u3) edge (u5)
(u3) edge (u6)
(u3) edge (u7);
\end{tikzpicture}
```



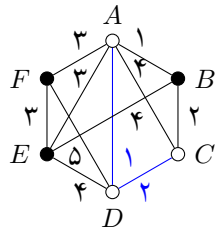
```
\begin{tikzpicture}
\vertex[fill] (u1) at (1,0) [label=left:$c$] {};
\vertex[fill] (u2) at (0,1) [label=left:$s$] {};
\vertex[fill] (u3) at (1,2) [label=left:$a$] {};
\vertex[fill] (u4) at (3,0) [label=right:$d$] {};
\vertex[fill] (u5) at (3,2) [label=right:$b$] {};
\vertex[fill] (u6) at (4,1) [label=right:$t$] {};
\path
(u1) edge node[pos=.8,below]{$15$} (u2)
(u1) edge node[pos=.6,right]{$6$} (u3)
(u1) edge node[pos=.4,below]{$7$} (u4)
(u1) edge node[pos=.6,below]{$14$} (u5)
(u2) edge node[pos=.3,above]{$18$} (u3)
(u3) edge node[pos=.4,above]{$9$} (u5)
(u4) edge node[pos=.5,right]{$10$} (u5)
(u5) edge node[pos=.8,above]{$28$} (u6)
(u4) edge node[pos=.8,below]{$36$} (u6);
\end{tikzpicture}
```



```
\begin{tikzpicture}
\vertex [fill] (w) at (30:1) [label=right:$B$] {};
\vertex [fill] (u) at (90:1) [label=above:$A$] {};
\vertex [fill] (v) at (150:1) [label=left:$F$] {};
\vertex [fill] (x) at (210:1) [label=left:$E$] {};
\vertex [fill] (y) at (270:1) [label=below:$D$]
{};
\vertex [fill] (z) at (330:1) [label=right:$C$] {};
\path
(u) edge node[above]{$3$} (v)
(u) edge node[pos=.4,above]{$1$}(w)
(u) edge node[pos=.4,above]{$4$}(z)
(u) edge node[pos=.8,right]{$1$}(y)
(u) edge node[above]{$3$}(x)
(v) edge node[left]{$3$}(x)
(x) edge node[pos=.7,below]{$4$}(w)
(x) edge node[below]{$4$}(y)
(y) edge node[below]{$2$}(z)
(y) edge node[pos=.3,left]{$5$}(v)
(z) edge node[right]{$2$}(w);
\end{tikzpicture}
```

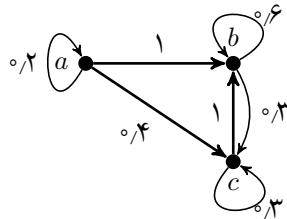


```
\begin{tikzpicture}
\vertex [fill] (w) at (30:1) [label=right:$B$]{};
\vertex (u) at (90:1) [label=above:$A$]{};
\vertex [fill] (v) at (150:1) [label=left:$F$]{};
\vertex [fill] (x) at (210:1) [label=left:$E$]{};
\vertex (y) at (270:1) [label=below:$D$]{};
\vertex (z) at (330:1) [label=right:$C$]{};
\path
(u) edge node[above]{$3$} (v)
(u) edge node[pos=.4,above]{$1$}(w)
(u) edge node[pos=.4,above]{$4$}(z)
(u) edge[blue] node[pos=.8,right]{$1$}(y)
(u) edge node[above]{$3$}(x)
(v) edge node[left]{$3$}(x)
(x) edge node[pos=.7,below]{$4$}(w)
(x) edge node[below]{$4$}(y)
(y) edge[blue] node[below]{$2$}(z)
(y) edge node[pos=.3,left]{$5$}(v)
(z) edge node[right]{$2$}(w);
\end{tikzpicture}
```




```
\begin{tikzpicture}[->,>=stealth',shorten >=0.2,
    auto,node distance=2.5cm,semithick,scale=1.3]
\vertex[fill] (a) at (0,0) [label=left:$a$] {};
\vertex[fill] (b) at (1.5,0) [label=above:$b$] {};
\vertex[fill] (c) at (1.5,-1) [label=below:$c$]
{};

\path
(a) edge [ma loop] node {$0.2$} (a)
(a) edge [draw, line width=1pt] node {$1$} (b)
(a) edge [draw, line width=1pt] node[below left]
{$0.4$} (c)
(b) edge [mb loop] node [right]{$0.6$} (b)
(b) edge [bend left] node {$0.3$} (c)
(c) edge [mc loop] node [right]{$0.3$} (c)
(c) edge [draw, line width=1pt] node {$1$} (b);
\end{tikzpicture}
```

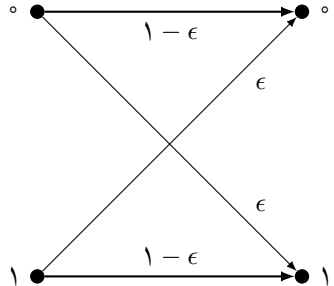


برای کد فوق، کتابخانه و دستور زیر نیاز هست.

```
\usetikzlibrary{arrows}
\tikzset{ma loop/.style={->,to path={ .. controls +(240:1) and +(120:1) .. (\tikztotarget) \tikztonodes}}}
\tikzset{mb loop/.style={->,to path={.. controls +(30:1) and +(130:1) .. (\tikztotarget) \tikztonodes}}}
\tikzset{mc loop/.style={->,to path={.. controls +(230:1) and +(330:1) .. (\tikztotarget) \tikztonodes}}}
```

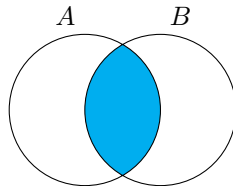
```
\begin{tikzpicture}[>=latex]
\vertex [fill](a1) at (0,0) [label=left:$0$]{};
\vertex [fill](b1) at (0,-3.5) [label=left:$1$]{};
\vertex [fill](a2) at (3.5,0) [label=right:$0$]{};
\vertex [fill](b2) at (3.5,-3.5) [label=right:
:$1$]{};

\path
(a1) edge[thick,->] node[below]{$1-\epsilon$}(a2)
(a1) edge[->] node[pos=0.8,anchor=south west]{$\epsilon$}
(b1) edge [->] node[pos=0.8,anchor=north west]{$\epsilon$}
(b1) edge[thick,->] node[above]{$1-\epsilon$}(b2);
\end{tikzpicture}
```



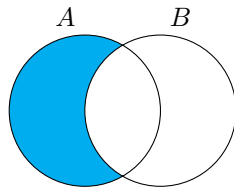
رسم نمودار ون:

```
\begin{tikzpicture}
\scope
\clip(1,0) circle (1);
\fill [cyan](0,0) circle (1);
\endscope
\draw (0,0) circle (1) (0,1) node [text=black,
above left] {$A$}
(1,0) circle (1) (1,1) node [text=
black,above right] {$B$};
\end{tikzpicture}
```



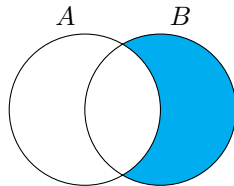
رسم نمودار ون:

```
\begin{tikzpicture}
\fill [cyan](0,0) circle (1);
\scope
\clip(1,0) circle (1);
\fill [white](0,0) circle (1);
\endscope
\draw (0,0) circle (1) (0,1) node [text=black,
above left] {$A$}
(1,0) circle (1) (1,1) node [text=
black,above right] {$B$};
\end{tikzpicture}
```



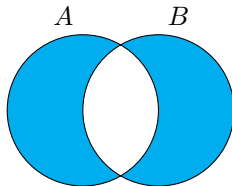
رسم نمودار ون:

```
\begin{tikzpicture}
\fill [cyan](1,0) circle (1);
\scope
\clip(0,0) circle (1);
\fill [white](1,0) circle (1);
\endscope
\draw (0,0) circle (1) (0,1) node [text=black,
above left] {$A$}
(1,0) circle (1) (1,1) node [text=
black,above right] {$B$};
\end{tikzpicture}
```



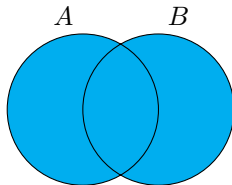
رسم نمودار ون:

```
\begin{tikzpicture}
\fill [cyan](0,0) circle (1);
\fill [cyan](1,0) circle (1);
\scope
\clip(1,0) circle (1);
\fill [white](0,0) circle (1);
\endscope
\draw (0,0) circle (1) (0,1) node [text=black,
above left] {$A$}
(1,0) circle (1) (1,1) node [text=
black,above right] {$B$};
\end{tikzpicture}
```



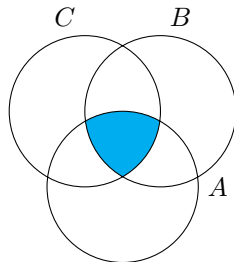
رسم نمودار ون:

```
\begin{tikzpicture}
\fill [cyan](0,0) circle (1);
\fill [cyan](1,0) circle (1);
\draw (0,0) circle (1) (0,1) node [text=black,
above left] {$A$}
(1,0) circle (1) (1,1) node [text=
black,above right] {$B$};
\end{tikzpicture}
```



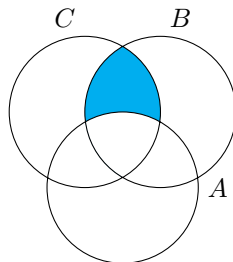
رسم نمودار ون:

```
\begin{tikzpicture}
\scope
\clip(0,0) circle (1);
\clip(1,0) circle (1);
\fill [cyan](.5,-1) circle (1);
\endscope
\draw (0,0) circle (1) (0,1) node [text=black,
above left] {$C$}
(1,0) circle (1) (1,1) node [text=
black,above right] {$B$}
(.5,-1) circle (1) (1.5,-1) node [text
=black,right] {$A$};
\end{tikzpicture}
```



رسم نمودار ون:

```
\begin{tikzpicture}
\scope
\clip(1,0) circle (1);
\fill [cyan](0,0) circle (1);
\clip(1,0) circle (1);
\fill [white](.5,-1) circle (1);
\endscope
\draw (0,0) circle (1) (0,1) node [text=black,
above left] {$C$}
(1,0) circle (1) (1,1) node [text=black,
above right] {$B$}
(.5,-1) circle (1) (1.5,-1) node [text=
black,right] {$A$};
\end{tikzpicture}
```



رسم نمودار و ن:

```
\documentclass[12pt,a4paper]{report}
\usepackage{tikz}
\def\firstcircle{(0,0) circle (1.5cm)}
\def\secondcircle{(2,0) circle (1.5cm)}
\def\thirdcircle{(1,1.5) circle (1.5cm)}
\colorlet{circle edge}{blue!100}
\colorlet{circle area}{blue!10}
\tikzset{filled/.style={fill=circle area,draw=circle edge,thick},outline/.
style={draw=circle edge,thick}}

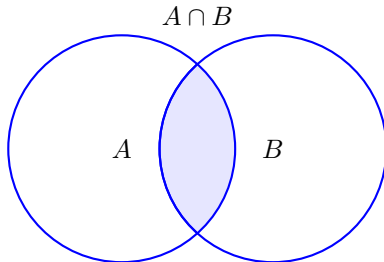
\begin{document}
\begin{center}

\end{center}
\end{document}
```

توجه: کدهایی زیر را در کد فایل فوق (★) قرار دهید.

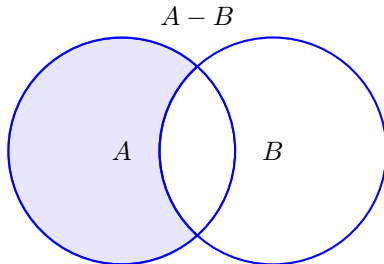
رسم نمودار ون:

```
\begin{tikzpicture}
\begin{scope}
\clip \firstcircle;
\fill[filled] \secondcircle;
\end{scope}
\draw[outline] \firstcircle node {$A$};
\draw[outline] \secondcircle node {$B$};
\node[anchor=south]at (current bounding box.
north) {$A \cap B$};
\end{tikzpicture}
```



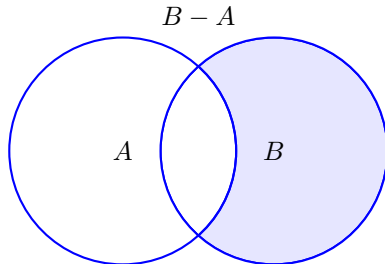
رسم نمودار ون:

```
\begin{tikzpicture}
\begin{scope}
\clip \firstcircle;
\draw[filled,even odd rule]\firstcircle node
{$A$} \secondcircle;
\end{scope}
\draw[outline]\firstcircle \secondcircle node
{$B$};
\node[anchor=south] at (current bounding box.
north) {$A - B$};
\end{tikzpicture}
```



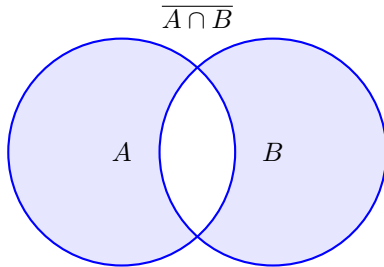
رسم نمودار ون:

```
\begin{tikzpicture}
\begin{scope}
\clip \secondcircle;
\draw[fill=blue!20,even odd rule] \firstcircle
\secondcircle node {$B$};
\end{scope}
\draw[outline] \firstcircle node {$A$}
\secondcircle;
\node[anchor=south] at (current bounding box.
north) {$B - A$};
\end{tikzpicture}
```



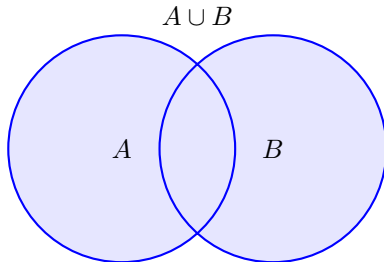
رسم نمودار ون:

```
\begin{tikzpicture}
\draw[fill=blue,even odd rule]\firstcircle node
{$A$}\secondcircle node{$B$};
\node[anchor=south] at (current bounding box.
north) {$\overline{A \cap B}$};
\end{tikzpicture}
```



رسم نمودار ون:

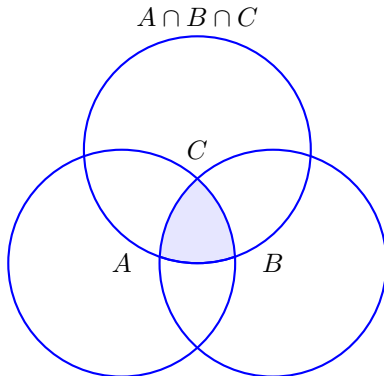
```
\begin{tikzpicture}
\draw[fill] \firstcircle node {$A$}
\secondcircle node {$B$};
\node[anchor=south] at (current bounding box.
north) {$A \cup B$};
\end{tikzpicture}
```



رسم نمودار ون:

```
\begin{tikzpicture}
\begin{scope}
\clip \firstcircle;
\clip \secondcircle;
\fill[filled] \thirdcircle;
\end{scope}
\draw[outline] \firstcircle node {$A$};
\draw[outline] \secondcircle node {$B$};
\draw[outline] \thirdcircle node {$C$};

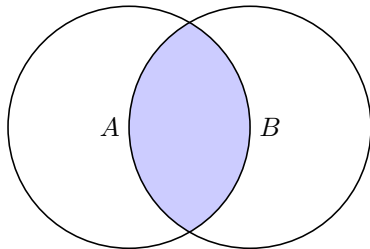
\node[anchor=south] at (current bounding box.
north) {$A \cap B \cap C$};
\end{tikzpicture}
```



`\usepackage{tkz-euclide}`

رسم نمودار ون: با استفاده از بسته

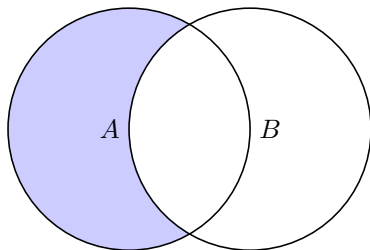
```
\begin{tikzpicture}
\tkzDefPoint(0,0){A}
\tkzDefPoint(2,0){B}
\begin{scope}
\tkzClipCircle(A,B) \tkzClipCircle(B,A)
\tkzFillCircle[color=blue!20](A,B)
\end{scope}
\tkzDrawCircle(A,B)
\tkzDrawCircle(B,A)
\tkzLabelPoints[left](A)
\tkzLabelPoints[right](B)
\end{tikzpicture}
```



`\usepackage{tkz-euclide}`

```
\begin{tikzpicture}
\tkzDefPoint(0,0){A}
\tkzDefPoint(2,0){B}
\tkzFillCircle[color=blue!20](A,B)
\begin{scope}
\tkzClipCircle(B,A)
\tkzFillCircle[color=white](A,B)
\end{scope}
\tkzDrawCircle(A,B)
\tkzDrawCircle(B,A)
\tkzLabelPoints[left](A)
\tkzLabelPoints[right](B)
\end{tikzpicture}
```

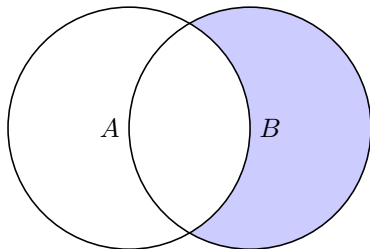
رسم نمودار ون: با استفاده از بسته



`\usepackage{tkz-euclide}`

```
\begin{tikzpicture}
\tkzDefPoint(0,0){A}
\tkzDefPoint(2,0){B}
\tkzFillCircle[color=blue!20](B,A)
\begin{scope}
\tkzClipCircle(B,A)
\tkzFillCircle[color=white](A,B)
\end{scope}
\tkzDrawCircle(A,B)
\tkzDrawCircle(B,A)
\tkzLabelPoints[left](A)
\tkzLabelPoints[right](B)
\end{tikzpicture}
```

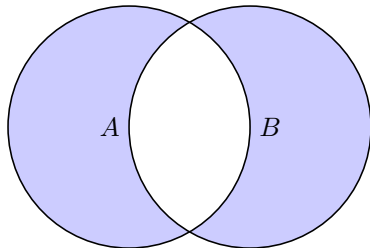
رسم نمودار ون: با استفاده از بسته



`\usepackage{tkz-euclide}`

رسم نمودار ون: با استفاده از بسته

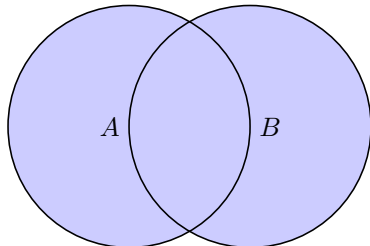
```
\begin{tikzpicture}
\tkzDefPoint(0,0){A}
\tkzDefPoint(2,0){B}
\tkzFillCircle[color=blue!20](A,B)
\tkzFillCircle[color=blue!20](B,A)
\begin{scope}
\tkzClipCircle(B,A)
\tkzFillCircle[color=white](A,B)
\end{scope}
\tkzDrawCircle(A,B)
\tkzDrawCircle(B,A)
\tkzLabelPoints[left](A)
\tkzLabelPoints[right](B)
\end{tikzpicture}
```



`\usepackage{tkz-euclide}`

```
\begin{tikzpicture}
\tkzDefPoint(0,0){A}
\tkzDefPoint(2,0){B}
\tkzFillCircle[color=blue!20](A,B)
\tkzFillCircle[color=blue!20](B,A)
\tkzDrawCircle(A,B)
\tkzDrawCircle(B,A)
\tkzLabelPoints[left](A)
\tkzLabelPoints[right](B)
\end{tikzpicture}
```

رسم نمودار ون: با استفاده از بسته



انیمیشن مجموعه

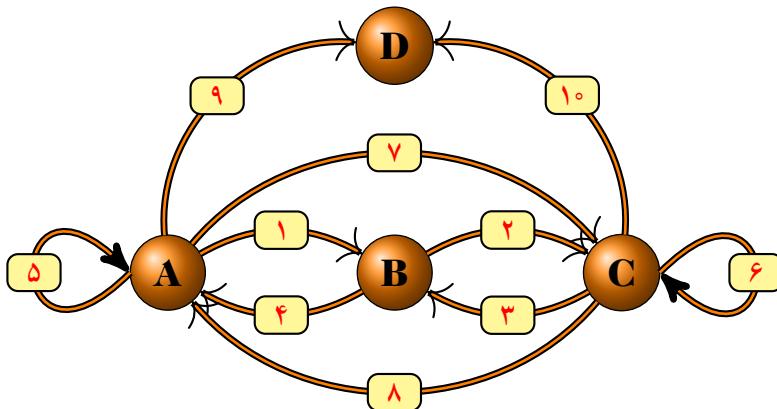
```

\documentclass[12pt,a4paper]{report}
\usepackage{tkz-graph}
\GraphInit[vstyle=Shade]
\tikzset{LabelStyle/.style={rectangle,rounded corners,draw,minimum width=2em,fill=yellow!50,text=red,font=\bfseries},
VertexStyle/.append style={inner sep=5pt,font=\Large\bfseries},
EdgeStyle/.append style={->,bend left}}

\begin{document}
\begin{tikzpicture}
\SetGraphUnit{5}
\Vertex{B}
\WE(B){A}
\EA(B){C}
\NO(B){D}
\Edge[label=1](A)(B)
\Edge[label=2](B)(C)
\Edge[label=3](C)(B)
\Edge[label=4](B)(A)
\Loop[dist=4cm,dir=NO,label=5](A.west)
\Loop[dist= 4cm,dir=SO,label=6](C.east)
\tikzset{EdgeStyle/.append style={bend left=50}}
\Edge[label=7](A)(C)
\Edge[label=8](C)(A)
\Edge[label=9](A)(D)
\tikzset{EdgeStyle/.append style={bend right}}
\Edge[label=10](C)(D)
\end{tikzpicture}
\end{document}

```



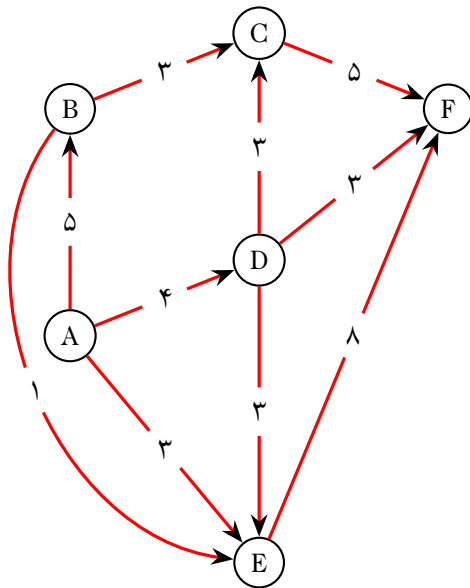



```

\documentclass[12pt,a4paper]{report}
\usepackage{tikz}
\usetikzlibrary{arrows.meta}
\begin{document}
\begin{tikzpicture}
\begin{scope}[every node/.style={circle,thick,draw}]
\node (A) at (0,0) {A};
\node (B) at (0,3) {B};
\node (C) at (2.5,4) {C};
\node (D) at (2.5,1) {D};
\node (E) at (2.5,-3) {E};
\node (F) at (5,3) {F} ;
\end{scope}
\begin{scope}[>={Stealth[black]},every node/.style={fill=white,circle},every edge/.style={draw=red,very thick}]
\path [->] (A) edge node {$5$} (B)
(B) edge node {$3$} (C)
(A) edge node {$4$} (D)
(D) edge node {$3$} (C)
(A) edge node {$3$} (E)
(D) edge node {$3$} (E)
(D) edge node {$3$} (F)
(C) edge node {$5$} (F)
(E) edge node {$8$} (F)
(B) edge[bend right=60] node {$1$} (E);
\end{scope}
\end{tikzpicture}
\end{document}

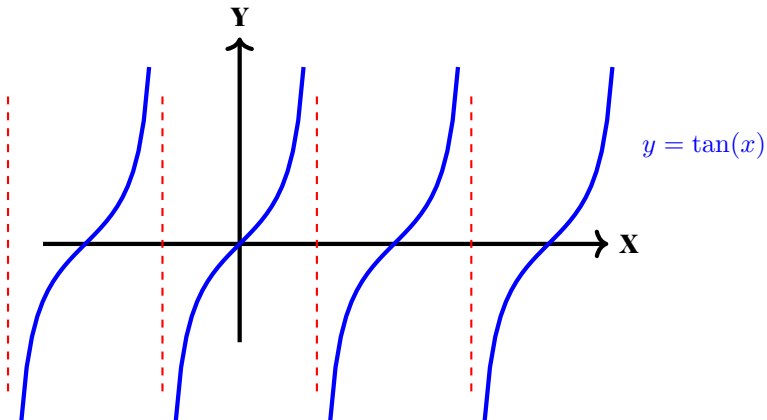
```





```
\documentclass{report}
\usepackage{tikz}
\usepackage{xcolor}
\begin{document}
\begin{center}
\begin{tikzpicture}[scale=0.8]
\draw[ultra thick, ->] (-4,0) -- (7.5,0) node[right] {$\textbf{X}$};
\draw[ultra thick, ->] (0,-2) -- (0,4.2) node[above] {$\textbf{Y}$};
\foreach \i in {-1, 0, 1, 2}{
\pgfmathsetmacro{\start}{\i*pi-1.3}
\pgfmathsetmacro{\left}{(\i-0.5)*pi}
\pgfmathsetmacro{\end}{\i*pi+1.3}
\draw[dashed, thick, red] (\left,-3) -- (\left,3);
\draw[ultra thick, color=blue] plot [domain=\start:\end, samples=25] (\x, {\tan(\x r)})
};
\node[blue, right] at (8, 2) {$y = \tan(x)$};
\end{tikzpicture}
\end{center}
\end{document}
```



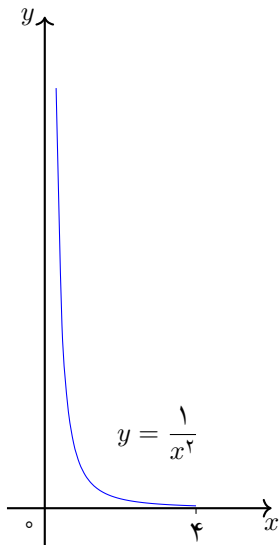


```
\begin{tikzpicture}[scale=.5]
\draw[->,thick] (-1,0) -- (6,0) node[below] {$x$};
\draw[->,thick] (0,-1) -- (0,13) node[left] {$y$};
\draw (4,0) -- (4,-0.15) node[below]{$4 $};

\draw[domain=0.3:4,smooth,variable=\x,blue] plot (\x,{1/(\x^2)});

\node at (3,2) {$y=\dfrac{1}{x^2} $};
\node at (-.4,-.5) {$0 $};
\end{tikzpicture}
```



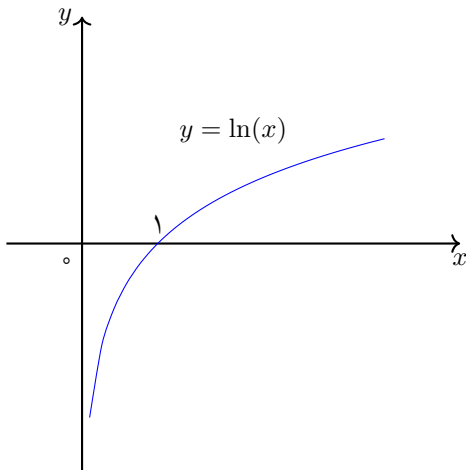


```
\begin{tikzpicture}[scale=1]
\draw[->,thick] (-1,0) -- (5,0) node[below] {$x$};
\draw[->,thick] (0,-3) -- (0,3) node[left] {$y$};
\draw (1,0) node[above]{$1$};

\draw[domain=0.1:4,smooth,variable=\x,blue] plot (\x,{ln(\x)});

\node at (2,1.5) {$y=\ln(x)$};
\node at (-.2,-.25) {$0$};
\end{tikzpicture}
```





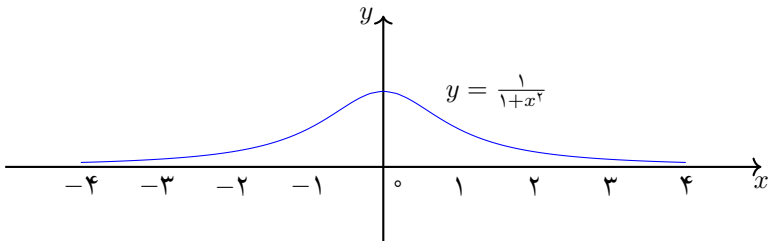

```
\begin{tikzpicture}[scale=1]
\draw[->,thick] (-5,0) -- (5,0) node[below] {$x$};
\draw[->,thick] (0,-1) -- (0,2) node[left] {$y$};

\foreach \x in {-4,-3,-2,-1,1,2,3,4}
\draw (\x,-.25) node{$\x$};

\draw[domain=0:4,smooth,variable=\x,blue] plot (\x,{1/(1+\x^2)});
\draw[domain=-4:0,smooth,variable=\x,blue] plot (\x,{1/(1-\x^2)});

\node at (1.5,1) {$y=\frac{1}{1+x^2}$};
\node at (.2,-.25) {$0$};
\end{tikzpicture}
```





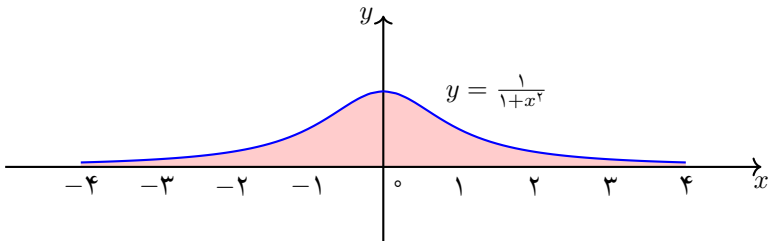
```
\begin{tikzpicture}[scale=1]
\def\funax{\x,{1/(1+\x^2)}}
\def\funbx{\x,{1/(1-\x^2)}}
\fill [fill=red!20] (0,0) -- plot[domain=0:4] (\funax) --(4,0);
\fill [fill=red!20] (-4,0) -- plot[domain=-4:0] (\funbx) --(0,0);
\draw[->,thick] (-5,0) -- (5,0) node[below] {$x$};
\draw[->,thick] (0,-1) -- (0,2) node[left] {$y$};

\foreach \a in {-4,-3,-2,-1,1,2,3,4}
\draw (\a,-.25) node{$\a$};

\draw[domain=0:4,smooth,variable=\x,blue,thick] plot (\funax);
\draw[domain=-4:0,smooth,variable=\x,blue,thick] plot (\funbx);

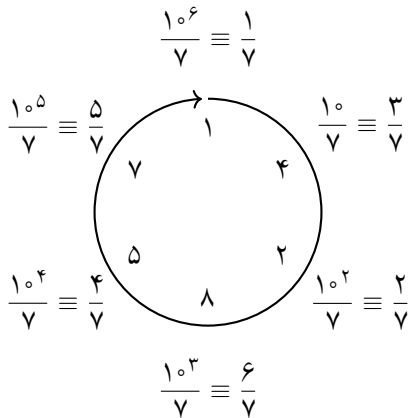
\node at (1.5,1) {$y=\frac{1}{1+x^2}$};
\node at (.2,-.25) {$0$};
\end{tikzpicture}
```





```
\documentclass[12pt,a4paper]{report}
\usepackage{amsmath}
\usepackage{tikz}
\newcommand{\nfrac}[1]{\dfrac{#1}{7}}
\begin{document}
\begin{center}
\begin{tikzpicture}[scale=1.5]
\draw[thick, ->] (0,1) arc (90:-267:1);
\foreach \x/\xtext in {30/4,90/1,150/7,210/5, 270/8,330/2}
\node at (\x:0.75cm) {$\xtext $};
\foreach \x/\xtext/\y in {
30/\nfrac{10}{\nfrac{3}{,
90/\nfrac{10^6}{\nfrac{1}{,
150/\nfrac{10^5}{\nfrac{5}{,
210/\nfrac{10^4}{\nfrac{4}{,
270/\nfrac{10^3}{\nfrac{6}{,
330/\nfrac{10^2}{\nfrac{2}{
}}
\node at (\x:1.55cm) {$\xtext \equiv \y$};
\end{tikzpicture}
\end{center}
\end{document}
```





```

\documentclass{report}
\usepackage{tikz-cd}

\begin{document}

\begin{center}
\begin{tikzcd}
A \ar[r,shift left=.75ex,"f"] \ar[r,shift right=.75ex,swap,"g"]
& B \ar[r,"u"] & C \\
\end{tikzcd}
\end{center}

\begin{center}
\begin{tikzcd}
U \times V \arrow[dr,swap,"f"] \arrow[r,"j"] \arrow[rr,bend left,"t"]
& F \sim U \times V \arrow[d,dashed,"\sigma"] \arrow[r,"\pi"] \\
& U \otimes V \arrow[dl,dashed,"\tau"] \\
& \backslash & W
\end{tikzcd}
\end{center}

\end{document}

```

خروجی



$$A \begin{array}{c} \xrightarrow{f} \\ \xrightarrow{g} \end{array} B \xrightarrow{u} C$$

$$\begin{array}{ccccc} & & t & & \\ & \searrow & & \nearrow & \\ U \times V & \xrightarrow{j} & F^{U \times V} & \xrightarrow{\pi} & U \otimes V \\ & \searrow f & \downarrow \sigma & \nwarrow \tau & \\ & & W & & \end{array}$$


```
\documentclass{report}
\usepackage{tikz-cd}
\begin{document}

\begin{center}
\begin{tikzcd}
& A \arrow{dr}{g} \\\
B \arrow{ur}{f} \arrow{rr}{h} & \& C
\end{tikzcd}
\end{center}

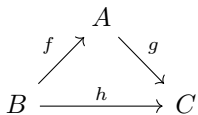
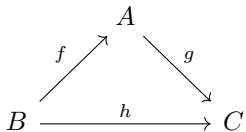
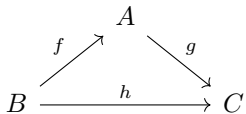
\begin{center}
\begin{tikzcd}[row sep=2.5em]
& A \arrow{dr}{g} \\\
B \arrow{ur}{f} \arrow{rr}{h} & \& C
\end{tikzcd}
\end{center}

\begin{center}
\begin{tikzcd}[column sep=1.5em]
& A \arrow{dr}{g} \\\
B \arrow{ur}{f} \arrow{rr}{h} & \& C
\end{tikzcd}
\end{center}

\end{document}
```

خروجی





















مروفت

بی‌موقفیت

رزوی موفقیت

با آرزوی موفقیت

با آرزوی موفقیت

با آرزوی موفقیت

با آرزوی موفقیت

با آرزوی موفقیت

با آرزوی موفقیت



با آرزوی موفقیت



با آرزوی موفقیت

TikZ