Graph-Tan
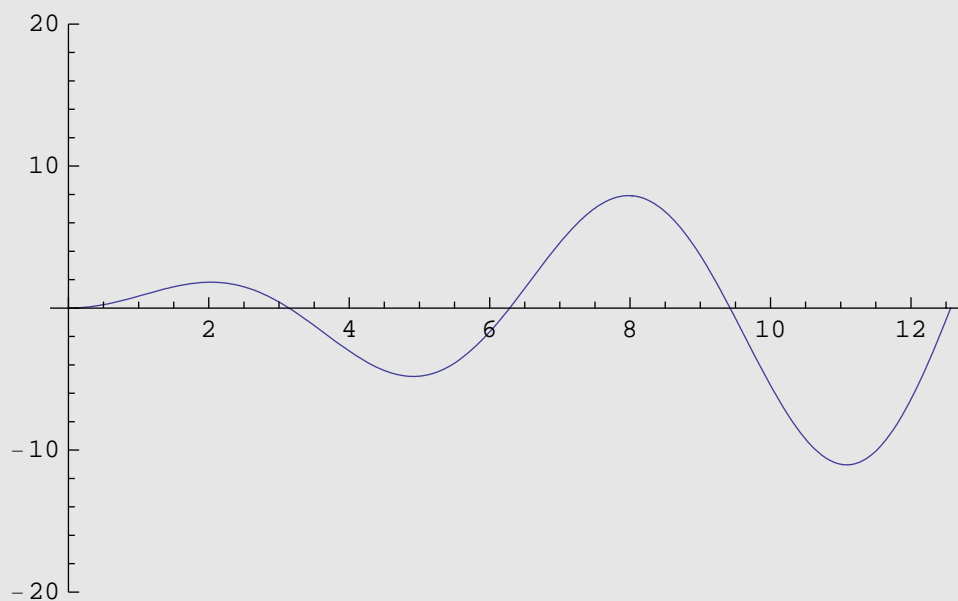
Let f(x)=xsinx. Graph f along with various tangent lines on the interval [0, 4π]

```
Clear[f]
```

```
f[x_] = x * Sin[x];
```

```
p1 = Plot[f[x], {x, 0, 4 * Pi}, PlotRange → {- 20, 20},
    DisplayFunction → Identity];
```

```
Show[p1, DisplayFunction → $DisplayFunction]
```


Since we will be graphing the tangent line for various values of x, we define the function tg below.

```
tg[x0_] := Module[{l, pl},
          l = f'[x0] * (x - x0) + f[x0];

    pl = Plot[l, {x, 0, 4 * Pi}, PlotRange → {-12, 12},
       DisplayFunction → Identity];
          Show[p1, pl]]
```

This function is definedusing Module because it performs several operations. First the variables l and pl are declared local the procedure tg. This means that if l and pl have other (global) values, changes in the value of l and pl within the procedure tg do not affect their (global) values. Then for a given value of x0, tg first define l to be the function f'[x0]*(x-x0)+f[x0], coresponding to the function with graph tangent to the graph of f at the point [x0,f(x0)] and pl to be the graph of l on the interval [0, 4π]

```
Show[tg[5], DisplayFunction → $DisplayFunction]
```
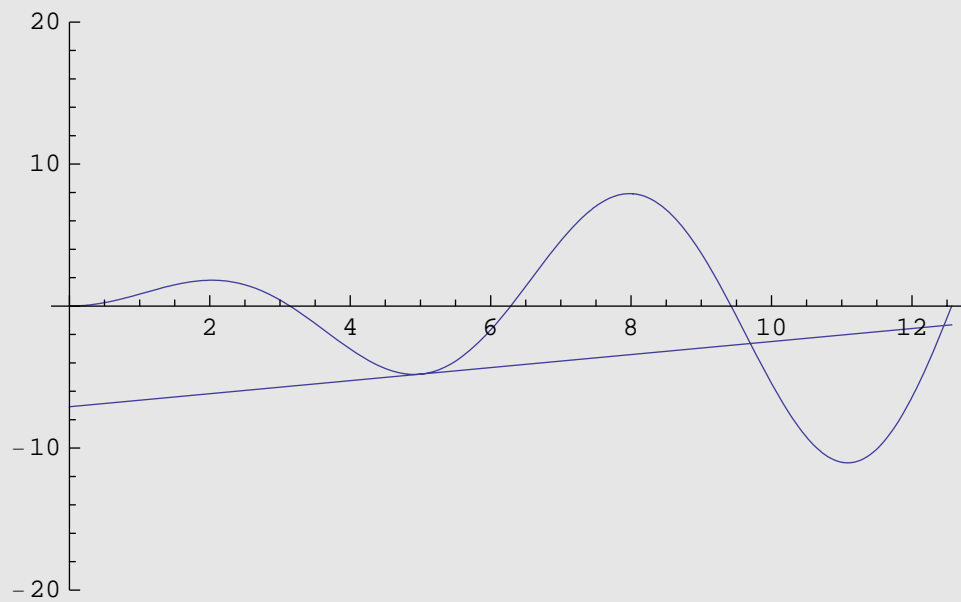


```
Do[Show[tg[n],
   DisplayFunction → $DisplayFunction], {n, 0, 4 * Pi, 4 * Pi / 16}]
```

```
graphs = Table[Show[tg[n], Ticks → None], {n, 0, 4 * Pi, 4 * Pi / 16}];
```

```
Toshow = Partition[graphs, 4];
```

```
Show[GraphicsArray[Toshow]]
```