```
(* Quiz 11 | AP Calculus BC | Problem 1| Shubleka *)
g[x_] := x^3 - 9 x^2 - 16 x;
```

The slope at the point of tangency can be measured in two ways: as the derivative of the given function and as a rise over run from (0, 0) to (a, g(a)).

In[13]:= `Solve[g'[x] == g[x] / x, x]`

Out[13]= $\left\{\{x \to 0\}, \left\{x \to \frac{9}{2}\right\}\right\}$

We find the slopes:

In[14]:= `g'[0]`

Out[14]= -16

In[15]:= `g'[9 / 2]`

Out[15]= $-\frac{145}{4}$

Next, we find the y-values by evaluating:

In[16]:= `g[0]`

Out[16]= 0

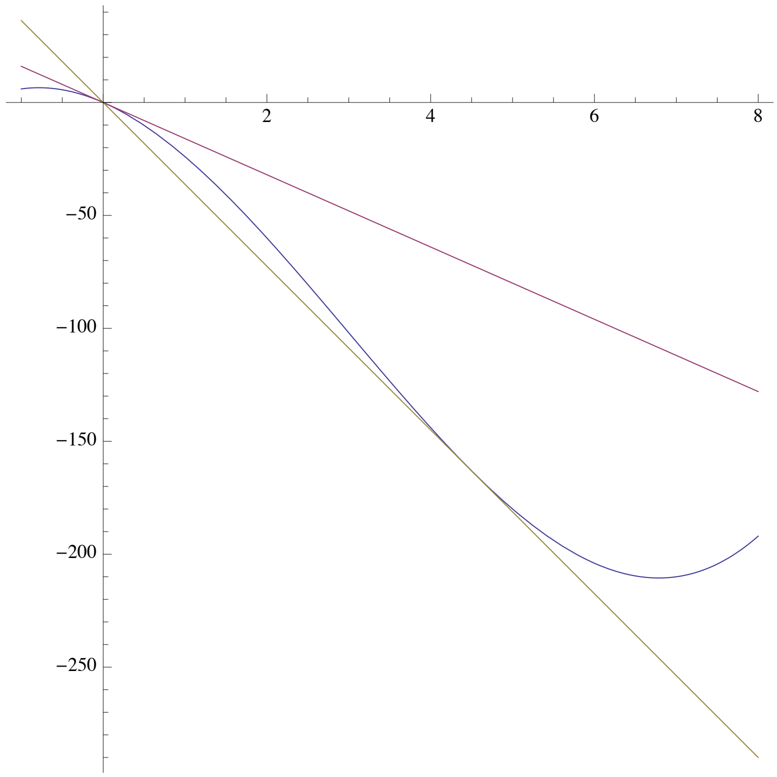
In[17]:= `g[9 / 2]`

Out[17]= $-\frac{1305}{8}$

Below we plot the two tangent lines and the original curve in the same window:

In[21]:=
```
Plot[{g[x], g[0] + g'[0] (x - 0), g[9 / 2] + g'[9 / 2] (x - (9 / 2))},
  {x, -1, 8}, AspectRatio → 1]
```

Out[21]=




```
(* Quiz 11 | AP Calculus BC | Problem 2| Shubleka *)
```

Use the limit definition of the derivative, and the conjugate technique to evaluate the derivative.

In[22]:=
```
D[1 / Sqrt[x - 3], x]
```

Out[22]= $-\frac{1}{2\,(-3+x)^{3/2}}$

```
(* Quiz 11 | AP Calculus BC | Problem 1| Shubleka *)
```

In[25]:=
```
f[x_] := 2 x^3 - x^2;
```

If perpendicular to the line x + 4y = 10, then the slope must be the negative reciprocal of -1/4, which is 4.

In[26]:=
```
Solve[f'[x] == 4, x]
```

Out[26]= $\left\{\left\{x \to -\frac{2}{3}\right\}, \{x \to 1\}\right\}$

These are the x-values at which the tangent lines are perpendicular to the given line.

```
(* Quiz 11 | AP Calculus BC | Problem 2| Shubleka *)
```

Use the limit definition of the derivative, and the conjugate technique to evaluate the derivative.

In[23]:= `D[(x - Pi) / (x + m), x]`

Out[23]= $\frac{1}{m + x} - \frac{-\pi + x}{(m + x)^2}$

In[24]:= `Simplify[%]`

Out[24]= $\frac{m + \pi}{(m + x)^2}$