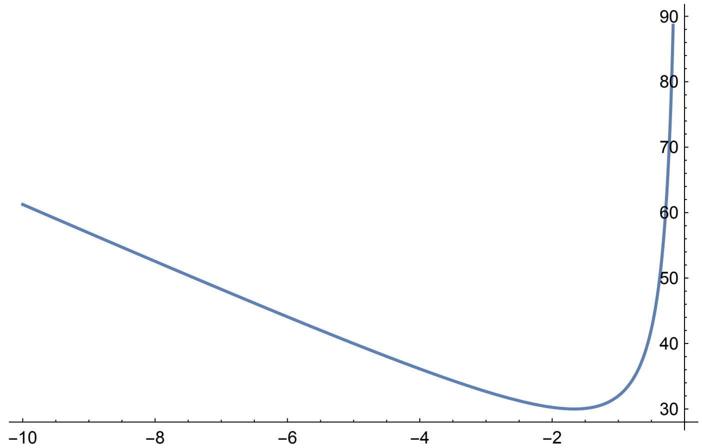
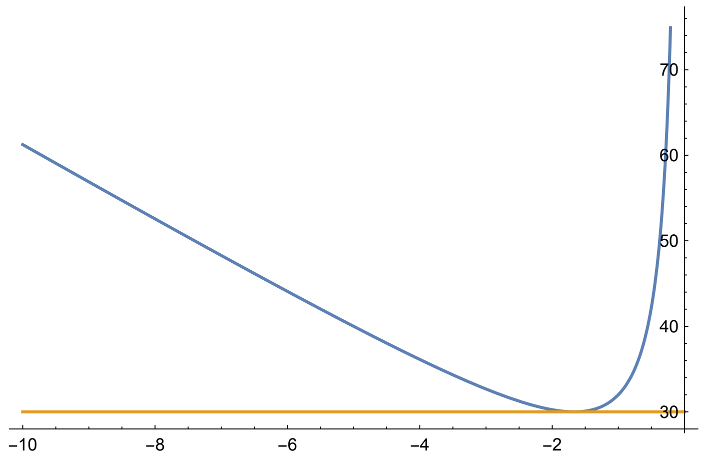
```
(* Quiz 21 | AP Calculus BC | Prepared by D. Shubleka *)

(* Problem 1 *)

L[x_] := m (x - 3) + 5;

Q[m_] := 0.5 ((-5 / m) + 3) * (5 - 3 m);

Plot[Q[m], {m, -10, 0}]
```



```
Simplify[Q'[m]]
```

$$-4.5 + \frac{12.5}{m^2}$$

```
Plot[{Q[m], Q[-5 / 3]}, {m, -10, 0}]
```



Use the First Derivative or Second Derivative Test to conclude that when m = -5/3 a global minimum occurs. The equation of the line is y = 5 - (5/3) (x-3).

```
(* Problem 2*)

f[x_] := x^2 / (x^2 + 3);
```

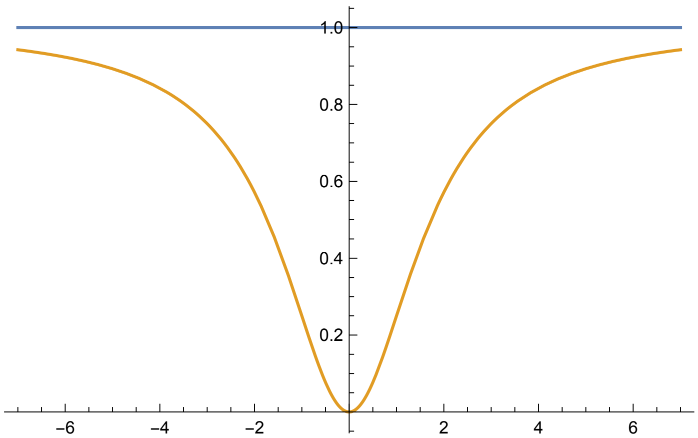
```
Simplify[f'[x]]
```

$$\frac{6\,x}{\left(3+x^2\right)^2}$$

```
Simplify[f''[x]]
```

$$-\frac{18\,\left(-1+x^2\right)}{\left(3+x^2\right)^3}$$

```
Plot[{1, f[x]}, {x, -7, 7}]
```

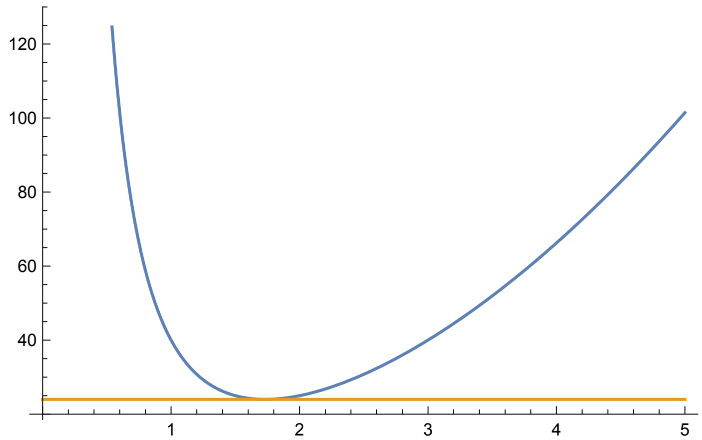


Comment: construct tables for each derivative; identify local and global extrema (one local and global min), inflection points (two), asymptotes (no VA, one HA), intercepts, ID behavior, and concavity.

```
(* Problem 1 *)

L[x_] := (-3 / a^2) (x - a) + (3 / a);

Q[a_] = (6 / a)^2 + (2 a)^2;

Simplify[Q'[a]]
```

$$\frac{8\,\left(-9+a^4\right)}{a^3}$$

```
Plot[{Q[a], Q[9^(1/4)]}, {a, 0, 5}]
```



```
Q[9^(1/4)]
```

24

The minimum length is Sqrt[24] or 2 Sqrt[6] units. Use the First or Second Derivative Test to conclude that this is a global minimum.

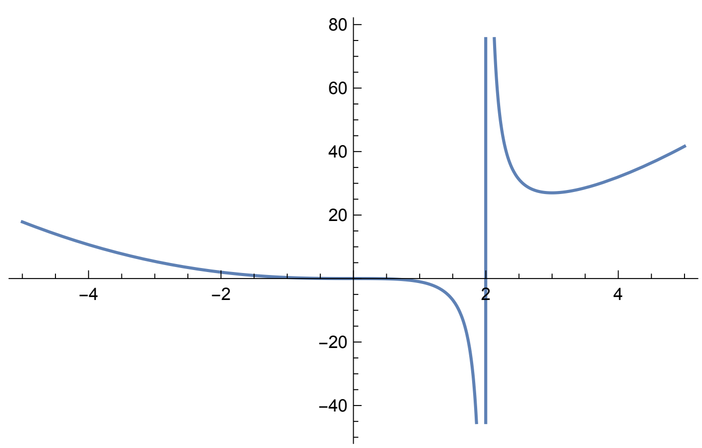
```
(* Problem 2 *)

h[x_] := x^3/(x-2);

Simplify[h'[x]]
```

$$\frac{2\ (-3+x)\ x^2}{(-2+x)^2}$$

```
Simplify[h''[x]]
```

$$\frac{2\ x\ \left(12-6\ x+x^2\right)}{(-2+x)^3}$$

```
Plot[h[x], {x, -5, 5}]
```



Comment: construct tables for each derivative; identify local and global extrema (one local min, no global extrema), inflection points (one), asymptotes (one VA, no HA, one curvilinear), intercepts, ID behavior, and concavity.