```
(*Quiz 27 | AP Calculus AB | Mr. Shubleka *)
(* ANSWER KEY ONLY *)
```

In[1]:= `f[x_] := x^2 / (x + 6);`

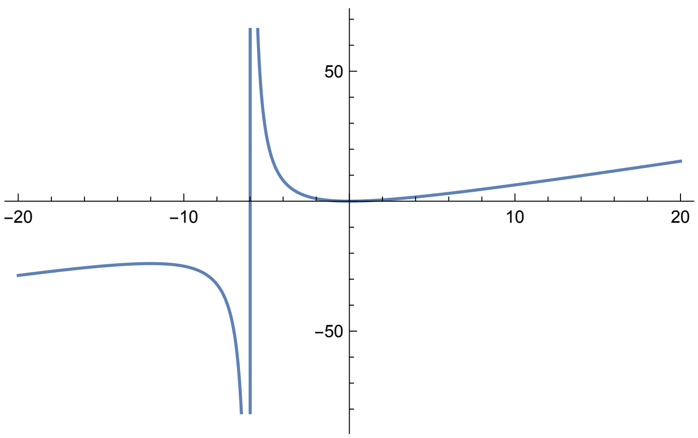
In[2]:= `Simplify[f'[x]]`

Out[2]= $$\frac{x\,(12+x)}{(6+x)^2}$$

In[3]:= `Simplify[f''[x]]`

Out[3]= $$\frac{72}{(6+x)^3}$$

In[5]:= `Plot[f[x], {x, -20, 20}]`

Out[5]= 

First Derivative Test

Suppose f(x) is a continuous at x=a and the derivative is zero or undefined at x=a.

a) If the first derivative changes from positive to negative, then f(a) is a local maximum.

b) If the first derivative changes from negative to positive, then f(a) is a local minimum.

c) If the first derivative does not change sign, then f(a) is not a local extremum.

Second Derivative Test

Suppse f is twice differentiable.

a) If f ‘ (a) = 0 and f “(a) > 0, then f(a) is a local minimum.

b) If f ‘(a) = 0 and f “(a) < 0, then f(a) is a local maximum.

b) If f ‘(a) = f “(a) = 0, then the test is inconclusive.

In[6]:= `g[x_] := x^2 / (x - 6);`

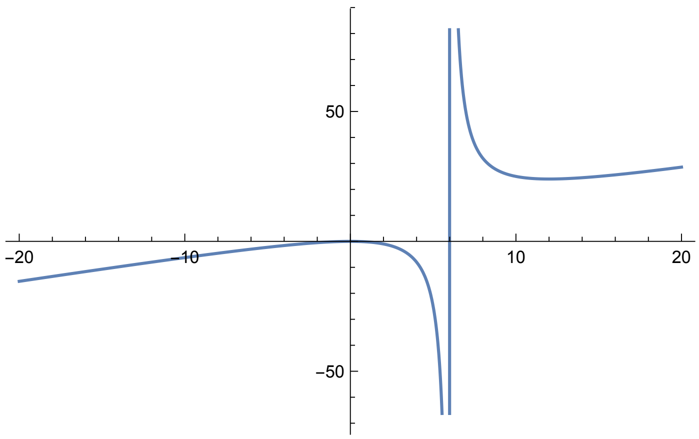
In[7]:= `Simplify[g'[x]]`

Out[7]= $$\frac{(-12+x)\,x}{(-6+x)^2}$$

In[8]:= **Simplify[g''[x]]**

Out[8]= $\frac{72}{(-6+x)^3}$

In[9]:= **Plot[g[x], {x, -20, 20}]**

Out[9]=


The Closed Interval Method

Suppose f(x) is continuous on a closed interval [a, b]. To find global extrema:

1) Find critical numbers of f(x) in the open interval (a, b).

2) Evaluate f(a), f(b) and all the critical numbers from Step 1.

3) The largest and smallest values from Step 2 are the absolute maximum and minimum, respectively.