```
> #This defines f at x as a function:
> f:=x->(1-x^2)/x^3;
```

$$f := x \rightarrow \frac{1 - x^2}{x^3} \quad (1)$$

```
> f(-x);
```

$$-\frac{1 - x^2}{x^3} \quad (2)$$

```
#since f(-x) = -f(x), therefore function is odd.
> with(Student[Calculus1]);
```

[*AntiderivativePlot, AntiderivativeTutor, ApproximateInt, ApproximateIntTutor, ArcLength, ArcLengthTutor, Asymptotes, Clear, CriticalPoints, CurveAnalysisTutor, DerivativePlot, DerivativeTutor, DiffTutor, ExtremePoints, FunctionAverage, FunctionAverageTutor, FunctionChart, FunctionPlot, GetMessage, GetNumProblems, GetProblem, Hint, InflectionPoints, IntTutor, Integrand, InversePlot, InverseTutor, LimitTutor, MeanValueTheorem, MeanValueTheoremTutor, NewtonQuotient, NewtonsMethod, NewtonsMethodTutor, PointInterpolation, RiemannSum, RollesTheorem, Roots, Rule, Show, ShowIncomplete, ShowSteps, Summand, SurfaceOfRevolution, SurfaceOfRevolutionTutor, Tangent, TangentSecantTutor, TangentTutor, TaylorApproximation, TaylorApproximationTutor, Understand, Undo, VolumeOfRevolution, VolumeOfRevolutionTutor, WhatProblem*] **(3)**

```
> Asymptotes(f(x),x);
```

$$[y = 0, x = 0] \quad (4)$$

```
> #This tells you the absolute extremas
>  minimize (f(x));
```

$$-\infty \quad (5)$$

```
> maximize (f(x));
```

$$\infty \quad (6)$$

```
#This solves for the value of x when f(x) = 0 (aka x-intercepts)
> solve (f(x),{x});
```

$$\{x = -1\}, \{x = 1\} \quad (7)$$

```
> This gives the first derivative of the function f(x) -> f'(x)
> f1:=x->diff(f(x),x);
```

$$f1 := x \rightarrow \frac{d}{dx} f(x) \quad (8)$$

```
> simplify (f1(x));
```

$$\frac{x^2 - 3}{x^4} \quad (9)$$

```
> #This solves for x when f'(x) = 0, i.e., either a local maxima
  or minima
> solve (f1(x),{x});
```

$$\{x = \sqrt{3}\}, \{x = -\sqrt{3}\} \quad (10)$$

```
> subs (x=-sqrt(3),f(x));
```

(11)

$$\frac{2}{9}\sqrt{3} \quad (11)$$

```
> subs (x=sqrt(3),f(x));
```

$$-\frac{2}{9}\sqrt{3} \quad (12)$$

$$3\sqrt{3} \quad (13)$$

```
> #This gives the second derviate f''(x)
> f2:=x->diff(f1(x),x);
```

$$f2 := x \rightarrow \frac{d}{dx} f1(x) \quad (14)$$

```
> simplify(f2(x));
```

$$-\frac{2\left(x^2-6\right)}{x^5} \quad (15)$$

```
> # when f''(x)< 0, it means it's a local max, f"(x) > 0, it's a local min, f"(x)=0, it's an inflection point.
  subs (x=-sqrt(3),f2(x));
  subs (x=sqrt(3),f2(x));
```

$$-\frac{2}{9}\sqrt{3}$$

$$\frac{2}{9}\sqrt{3} \quad (16)$$

```
> #This gives the inflection points (where concavity changes) - you dont have to worry about it for now.
> solve (f2(x),{x});
```

$$\{x=-\sqrt{6}\}, \{x=\sqrt{6}\} \quad (17)$$

```
> subs (x=-sqrt(6),f(x));
  subs (x=sqrt(6),f(x));
```

$$\frac{5}{36}\sqrt{6}$$

$$-\frac{5}{36}\sqrt{6} \quad (18)$$

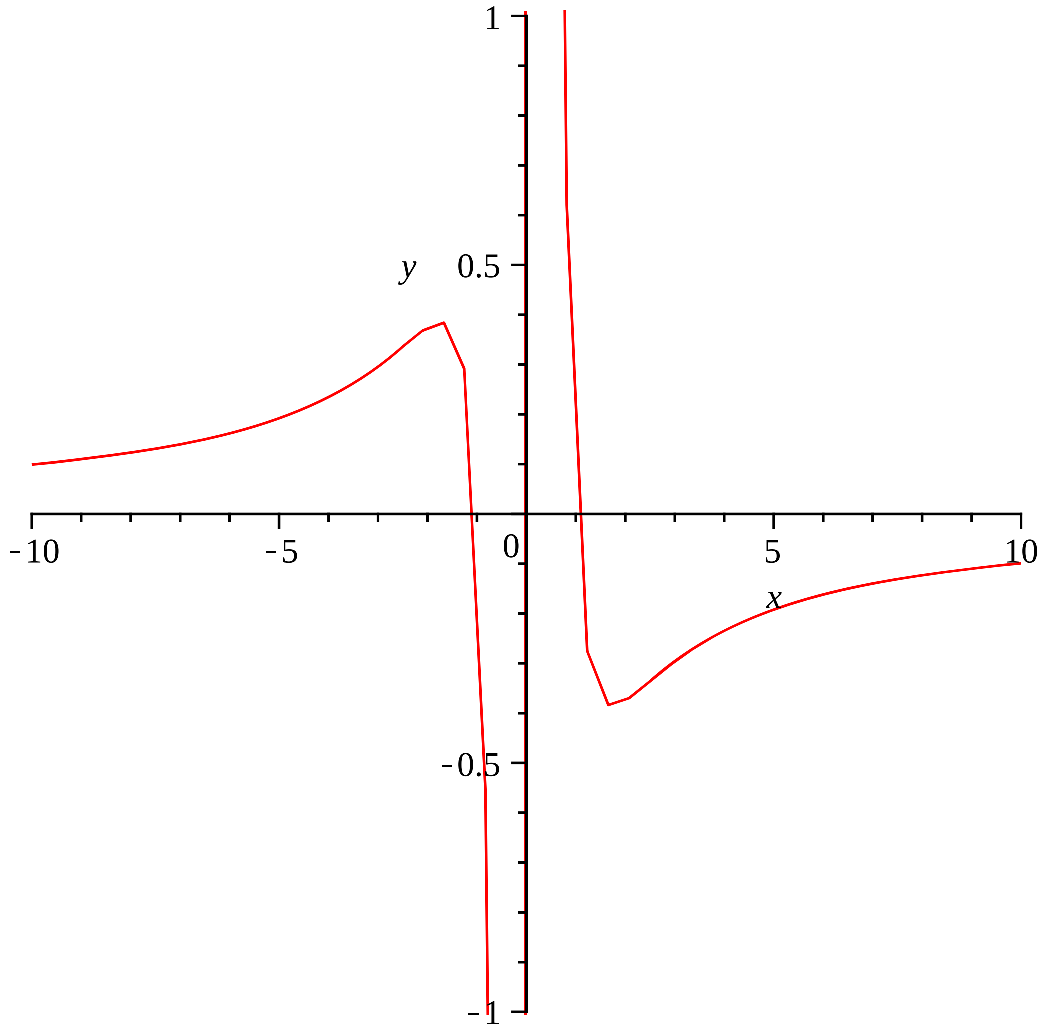
```
> #This will evaluate the limit at + infinitive
> limit (f(x), x=infinity);
```

$$0 \quad (19)$$

```
> #This will evaluate the limit at - infinitive
> limit (f(x), x=-infinity);
```

$$0 \quad (20)$$

```
> #This will plot a graph for this function
> plot (f(x),x=-10..10, y= -1..1);
```


1
0.5
y
-0.5
-1
-10
-5
0
5
10
x