Derivative of f(x) = (.5/(sqrt(1 + x^2))) - sqrt(1 + x^2)(1 - (.5/(1 + x^2))) + x

Derivative: Show steps

$$\frac{d}{dx}\left(f(x)=\frac{0.5}{\sqrt{1+x^2}}-\sqrt{1+x^2}\left(1-\frac{0.5}{1+x^2}\right)+x\right)=\left(f'(x)=\frac{x\left(-x^2-2.\right)}{\left(x^2+1\right)^{3/2}}+1\right)$$

Alternate form:

$$f'(x)=\frac{x^4+2.\,x^2-2.\,\sqrt{x^2+1}\;x-\sqrt{x^2+1}\;x^3+1.}{\left(x^2+1.\right)^2}$$

Expanded form: Show steps

$$f'(x)=-\frac{2.\,x}{\left(x^2+1\right)^{3/2}}-\frac{x^3}{\left(x^2+1\right)^{3/2}}+1$$

WolframAlpha

Derivative of f(x) = ((x (-x^2 - 2.))/(x^2 + 1)^(3/2) + 1)

Derivative: Show steps

$$\frac{d}{dx}\left(f(x)=\frac{x\left(-x^2-2.\right)}{\left(x^2+1\right)^{3/2}}+1\right)=\left(f'(x)=\frac{x^2-2.}{\sqrt{x^2+1}\;\left(x^2+1.\right)^2}\right)$$

Alternate forms:

$$f'(x)=\frac{x^2-2}{\left(x^2+1\right)^{5/2}}$$

$$f'(x)=\frac{\left(x^2-2.\right)\sqrt{x^2+1}}{\left(x^2+1.\right)^3}$$

$$f'(x)=\frac{x^2}{\sqrt{x^2+1}\;\left(x^2+1.\right)^2}-\frac{2.}{\sqrt{x^2+1}\;\left(x^2+1.\right)^2}$$

Alternate form assuming x is real:

$$f'(x)=\frac{x^2}{\sqrt{x^2+1}\;\left(x^2+1.\right)^2}-\frac{2.}{\sqrt{x^2+1}\;\left(x^2+1.\right)^2}+0.\,i$$

WolframAlpha

```
FirstDerivative[x_] := ((x (-(x^2) - 2)) / (((x^2) + 1)^(3 / 2))) + 1
FirstD[x_] := (x (-x^2 - 2.)) / (x^2 + 1)^(3 / 2) + 1
```

```
FirstDerivative[0.6]
```

```
0.107199
```

```
SecondDerivative[x_] := (((x^2) - 2)) / ((Sqrt[(x^2) + 1]) ((x^2) + 1)^2)
SecondD[x_] := (x^2 - 2.) / (Sqrt[x^2 + 1] (x^2 + 1.)^2)
```

```
SecondDerivative[0.6]
```

```
-0.76032
```

```
0.6 - (FirstDerivative[0.6] / SecondDerivative[0.6])
```

```
0.740991
```

```
% - (FirstDerivative[%] / SecondDerivative[%])
```

```
0.7861314312243325`
```

```
0.7861314312243325`
0.6 - (FirstD[0.6] / SecondD[0.6])
```

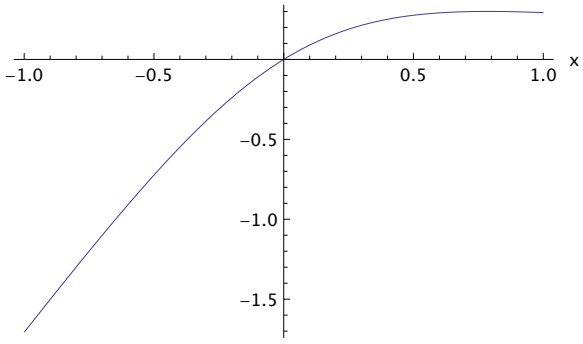
```
0.786131
```

Plot f(x) = (.5/(sqrt(1 + x^2))) - sqrt(1 + x^2)(1 - (.5/(1 + x^2))) + x

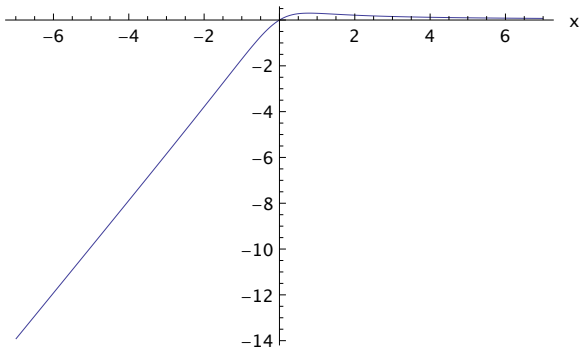
Input interpretation:

plot $f(x) = \frac{0.5}{\sqrt{1+x^2}} - \sqrt{1+x^2}\left(1 - \frac{0.5}{1+x^2}\right) + x$

Plots:



min max



min max

WolframAlpha

```
0.6 - (FirstD[0.6] / SecondD[0.6])
```

0.740991

```
% - (FirstD[%] / SecondD[%])
```

0.786151

```
% - (FirstD[%] / SecondD[%])
```

```
0.786151
```

```
% - (FirstD[%] / SecondD[%])
```

```
0.786151
```

```
% - (FirstD[%] / SecondD[%])
```

```
0.786151
```

```
% - (FirstD[%] / SecondD[%])
```

```
0.786151
```

```
.786151 - (FirstD[.786151] / SecondD[.786151])
```

```
0.786151
```

Max of f(x) = (.5/(sqrt(1 + x^2))) - sqrt(1 + x^2)(1 - (.5/(1 + x^2))) + x

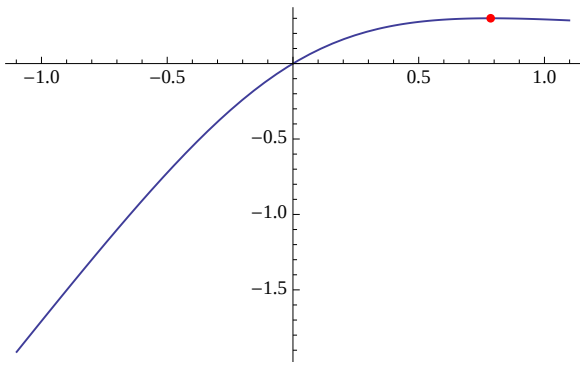
Input interpretation:

maximize $\frac{0.5}{\sqrt{1+x^2}} - \sqrt{1+x^2}\left(1 - \frac{0.5}{1+x^2}\right) + x$

Global maximum: Approximate form

$$\max\left\{\frac{0.5}{\sqrt{1+x^2}} - \sqrt{1+x^2}\left(1 - \frac{0.5}{1+x^2}\right) + x\right\} = \sqrt{\frac{5\sqrt{5}}{2} - \frac{11}{2}} \quad \text{at } x = \sqrt{\frac{1}{2}\left(-1+\sqrt{5}\right)}$$

Plot:



(x from −1 to 1)

WolframAlpha

```
OriginalFunc[x_] := (.5 / (Sqrt[1 + x^2])) - Sqrt[1 + x^2] (1 - (.5 / (1 + x^2))) + x
```

```
OriginalFunc[39 / 34]
```

```
0.282437
```

```
OriginalFunc[63 / 64]
```

```
0.293819
```

```
OriginalFunc[24 / 34]
```

```
0.298812
```

```
OriginalFunc[39 / 34]
```

```
0.282437
```

```
OriginalFunc[39 / 34]
```

```
0.282437
```

```
OriginalFunc[24 / 17]
```

```
0.25973
```