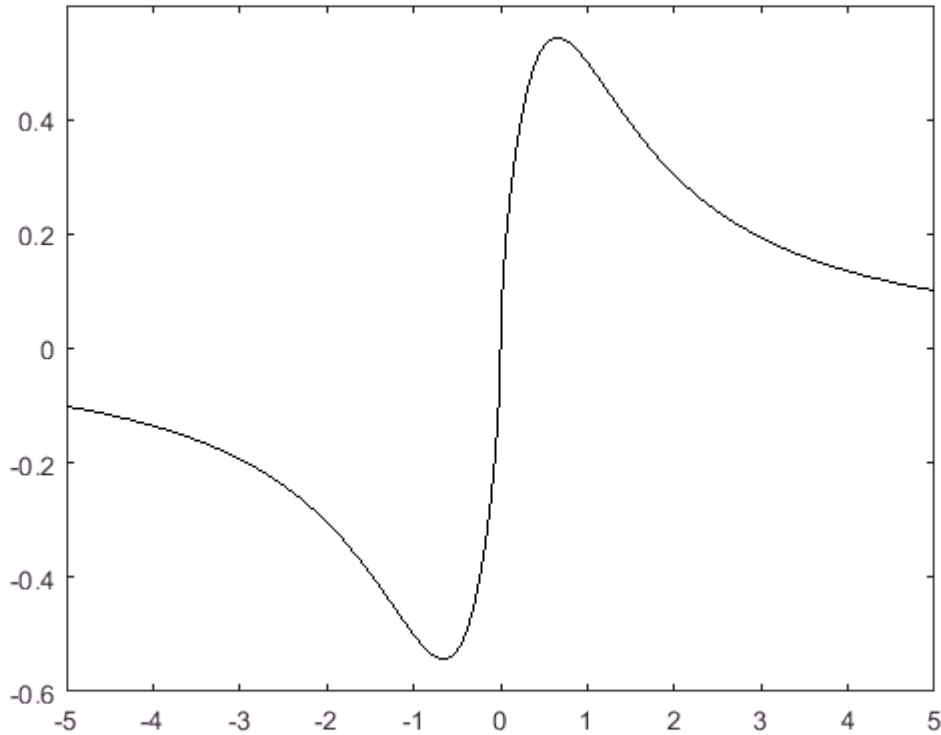


Matlab notes for HW #5

I want to graph $f(x)=x^{3/5}/(1+x^2)$. Matlab will only give half a graph unless we intervene. It will also give complex roots if we don't declare x to be a real number.

```
syms x real
y=sign(x)*abs(x^(1/5));
f(x)=y^3/(1+x^2);
fplot(f(x), 'k')
axis([-5 5 -0.6 0.6])
```



The derivative is

```
fp=diff(f(x),x)
```

fp =

$$\frac{3 \operatorname{sign}(x)^4}{5 |x|^{2/5} (x^2 + 1)} + \frac{6 |x|^{3/5} \delta(x) \operatorname{sign}(x)^2}{x^2 + 1} - \frac{2 x |x|^{3/5} \operatorname{sign}(x)^3}{(x^2 + 1)^2}$$

By inspection we see the derivative does not exist at $x = 0$. The derivative is zero when

```
vpa( solve(fp==0,x),4)
```

ans =

$$\begin{pmatrix} -0.6547 \\ 0.6547 \end{pmatrix}$$

By inspecting the graph, we see the critical points are a minimum at $x = -0.6547$ and a maximum at $x = 0.6547$. We also have a critical point at $x = 0$, but it is a saddle, neither a minimum or maximum.