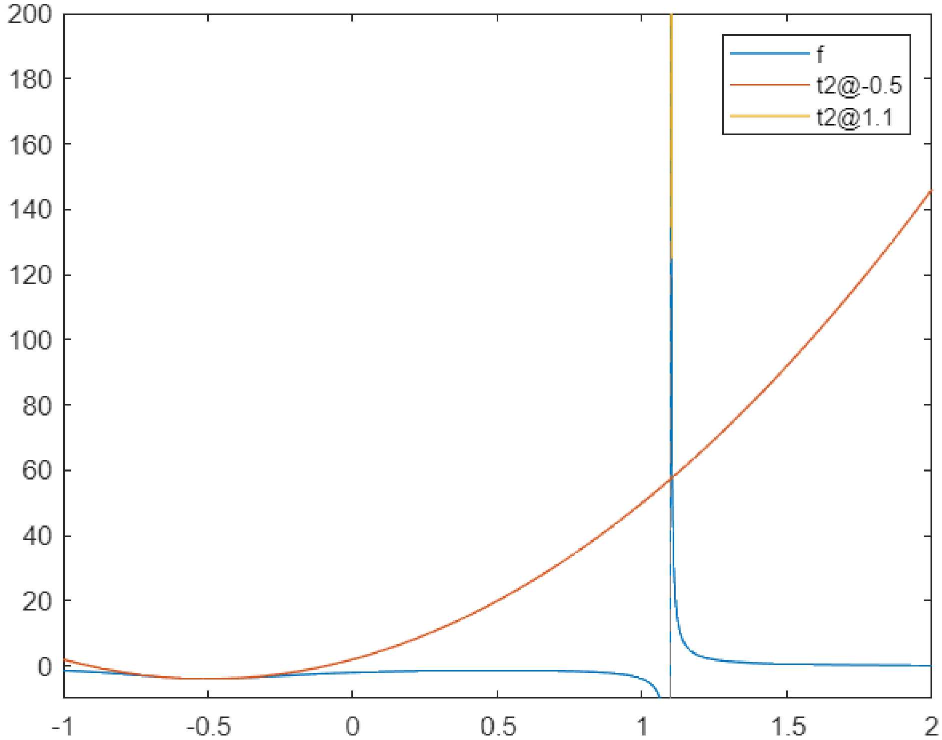
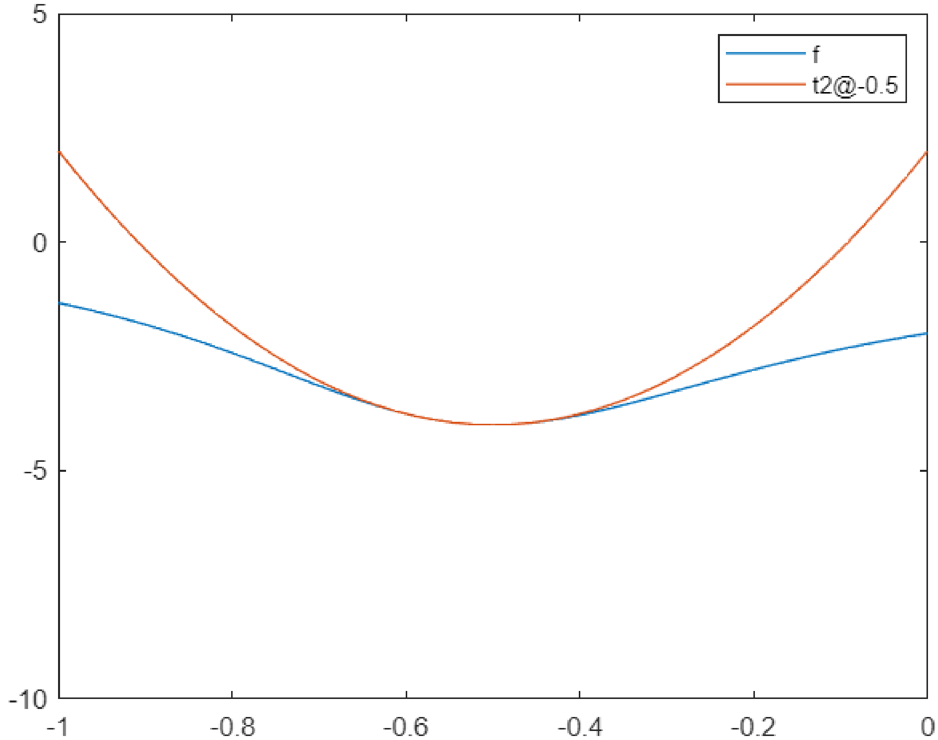
Problem E8.1

```
clear vars
syms x
f = 1/(x^3 - (3/4)*x - 1/2);
t1 = taylor(f, x, -0.5, 'Order', 3);
t2 = taylor(f, x, 1.1, 'Order', 3);
fplot([f, t1, t2], [-1, 2])
legend('f', 't2@-0.5', 't2@1.1')
ylim([-10, 200]);
```



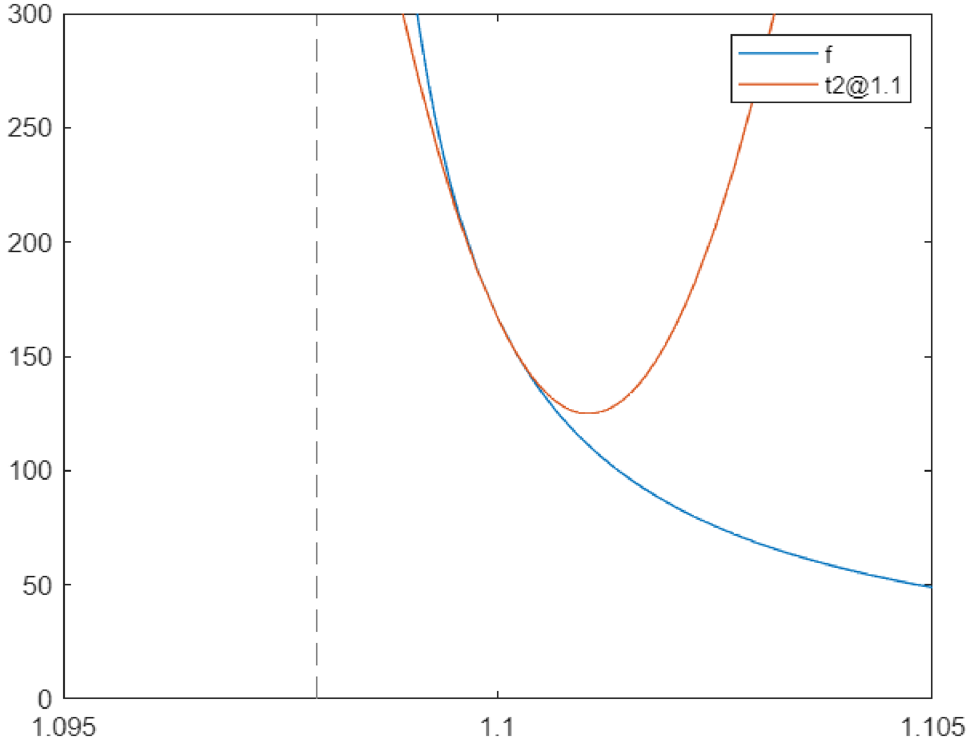
Since $x = 1.1$ is very close to the vertical asymptote of the original function, we cannot see how well these approximations do in the same graph so let's take a closer look at each one individually.

```
fplot([f, t1], [-1, 0])
legend('f', 't2@-0.5')
ylim([-10, 5]);
```



As we can see, the taylor expansion around $x = -0.5$ fits the original curve of f very nicely and can reasonably approximate a small neighborhood around -0.5.

```
fplot([f, t2], [1.095, 1.105])
legend('f', 't2@1.1')
ylim([0, 300]);
```



Taking into account the fact that the x-axis has been severely scaled down to accomodate for the fluctuations around $x = 1.1$ we can see that this second order expansion can also fit the original curve although on a much smaller interval of x. The reason for this is likely the fact that the curvature of the function is extremely steep around its vertical asymptote which makes it difficult to approximate with a second degree function that is inherently devoid of any asymptotes. Therefore, a best effort with a second order Taylor expansion can only fit a small neighborhood around the point at which the expansion was performed.