Limits and Derivatives[1]

1. Try the following commands:
```
syms  x  h
f = x^3 + x^2 + x + 1
m = (subs(f, x+h)-f)/h
f1 = limit(m, h, 0)
```
Explain what happened.

2. Try the following sequence:
```
syms  x  h
f = exp(sin(x))
m = (subs(f, x+h)-f)/h
f1 = limit(m, h, 0)
subs(f1, pi)
X = -10:.05:10; ..... Makes an array of x values.
F = subs(f, X); ..... Makes an array of f(x) values.
F1 = subs(f1, X);
plot(X, F, 'b', X, F1, 'r')
```
Explain what happened.

3. Now repeat the steps above for the function:

$$f(x) = (x-1)^2\sqrt{x} \qquad \texttt{(f = (x-1)^2*sqrt(x))}$$

Is the function defined for all real numbers? What about the derivative? How is the graph misleading?

4. Next repeat this procedure for the function $f(x) = (x-1)^2 x^{1/3}$. Are the function and its derivative defined for all real numbers? How is this graph misleading?

5. Use `ezplot(f)` and `ezplot(f1)` to get another picture for `f` and `f'` from #4. In what ways are these graphs misleading?

6. Prepare a brief (< 1 page) written report answering all the questions. Use complete sentences and standard mathematical notation. Do **not** get a printout.

This assignment is intended to reinforce the user's understanding of the definition of the derivative. They must think about the domains of the function and its derivative.