

# Week 3 (Pledged): Newton vs. Bisection

For an overview of Newton's  
method, see Jonathon's  
presentation.

# Outline

```
% solverace header
function solverace
--run for different values of tol
--- code --- calls debis and denewt and plots their iters per tol
Return
% denewt header
function [x, iter] = denewt(x,tol,L)
--- code --- Newton's method, calls coolfun and coolfundx
return
% debis header [GIVEN]
function [x, iter] = debis(a,b,tol,L)
--- code --- Bisection, calls coolfun
return
% coolfun header
function val = coolfun(x,L) [GIVEN]
--- code -- evaluate coolfun
return
% coolfundx header [Derivative of coolfun- take by hand]
function val = coolfundx(x,L)
--- code -- evaluate the derivative, with respect to x, of
coolfun
return
```

# Quiz Questions

1. To find the minimum of a function using Newton's method (the place where  $f'(x)=0$ , we would use:

A.  $x = f(x) - f'(x)/f''(x)$


B.  $x = x - f'(x)/f''(x)$

C.  $x = x - f''(x)/f'(x)$

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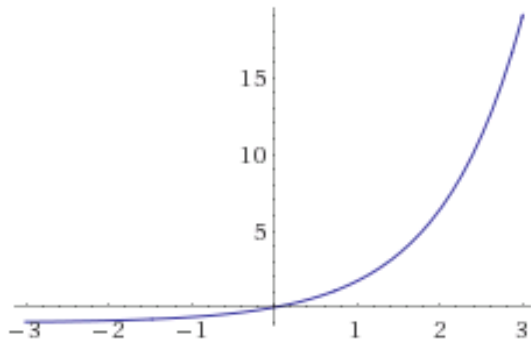
# Quiz Questions

5. For which function below will Newton's method ALWAYS succeed in finding a root, regardless of the initial input?

- ☐ A.  $\sin(x) - 1$
- ☐ B.  $e^x - 1$
- ☐ C.  $\text{abs}(x) - 1$
- ☐ D.  $x^2 - 1$

# Quiz Questions

5. For which function below will Newton's method ALWAYS succeed in finding a root, regardless of the initial input?

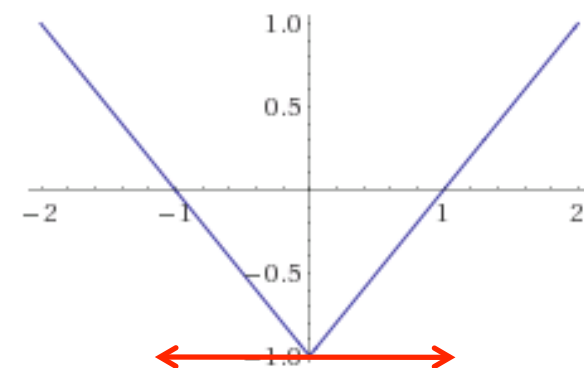
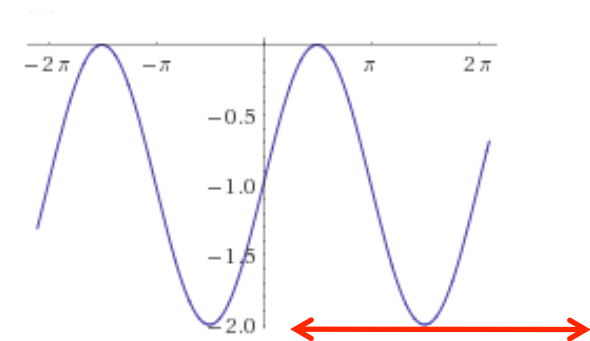
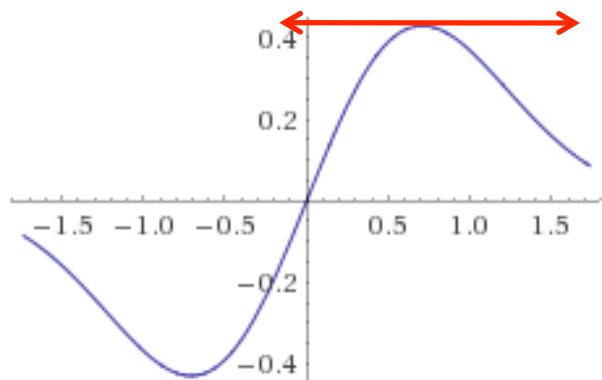


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☒ B.  $e^x - 1$

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# Quiz Questions

6. If  $f(x) = x \cdot \exp(-x^2)$  and we use Newton's Method to solve  $f(x) = 0$  commencing from the guess  $x=1$ , then the Newton iterates

- ☐ A. decrease to zero
- ☐ B. increase to infinity
- ☐ C. hop around



# Quiz Questions

6. If  $f(x) = x \cdot \exp(-x^2)$  and we use Newton's Method to solve  $f(x) = 0$  commencing from the guess  $x=1$ , then the Newton iterates

- ☐ A. decrease to zero
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# Quiz Questions

7. Using the following function file definition, called func.m, which of the following choices are true? (For this question, select ALL correct answers.).

```
function [x,t] = func(a,b)
```

```
x = a + b;
```

```
t = a*b;
```

```
return
```

- ☐ A. "I could have used 'end' instead of 'return'."
- ☐ B. x and t are the outputs.
- ☐ C. a and b are inputs.
- ☐ D. a and b are outputs.

# Quiz Questions

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x = a + b;
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t = a*b;
```

```
return
```

as long as you're  
consistent between  
functions.

- ☒ A. "I could have used 'end' instead of 'return'."
- ☒ B. x and t are the outputs.
- ☒ C. a and b are inputs.
- ☐ D. a and b are outputs.

# Debugging Tools

- keyboard: type keyboard at any line of the text, code will run through to that point and stop. (That way you can know if the errors are before or after that point). Also, while in that mode, you can hover your mouse over variable names in the editor and see values or structures assigned to them.
- ctrl + c from command line stops code at any point.

# Things to Remember

- you need a function header for each function (don't have to put your name on each)
- accumulate the outputs for each value of `tol` into a data structure that can be used for plotting later.