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1/27/17
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MP 2

Evaluate the function at various points to estimate roots:

Code:

```
%evaluates an input function every x units
lowerBound = -10;
upperBound = 10;
xValue = lowerBound;
step = 0.5; %space between evaluated locations
results = []; %array to hold the results
while xValue <= upperBound %evaluate the function at various points
   y = f1(xValue); %f1 is a separate function file
   fprintf('At x = %f, y = %f\n', xValue, y);
   results = [results f1(xValue)]; %append the result in an array.
   xValue += step;
end;
```

Output:

```
At x = -10.000000, y = 5508.264186
At x = -9.500000, y = 4048.910570
At x = -9.000000, y = 2841.426093
At x = -8.500000, y = 1858.176775
At x = -8.000000, y = 1073.028640
At x = -7.500000, y = 461.347707
At x = -7.000000, y = -0.000000
At x = -6.500000, y = -332.648461
At x = -6.000000, y = -556.731654
At x = -5.500000, y = -690.883557
At x = -5.000000, y = -752.238148
At x = -4.500000, y = -756.429406
At x = -4.000000, y = -717.591310
At x = -3.500000, y = -648.357837
At x = -3.000000, y = -559.862967
At x = -2.500000, y = -461.740676
At x = -2.000000, y = -362.124944
At x = -1.500000, y = -267.649750
At x = -1.000000, y = -183.449071
At x = -0.500000, y = -113.156885
At x = 0.000000, y = -58.907172
At x = 0.500000, y = -21.333909
At x = 1.000000, y = 0.428924
At x = 1.500000, y = 8.747351
At x = 2.000000, y = 7.487392
At x = 2.500000, y = 2.015069
At x = 3.000000, y = -0.803596
At x = 3.500000, y = 7.397418
At x = 4.000000, y = 36.484133
At x = 4.500000, y = 97.822570
```

```
At x = 5.000000, y = 204.278752
At x = 5.500000, y = 370.218699
At x = 6.000000, y = 611.508435
At x = 6.500000, y = 945.513979
At x = 7.000000, y = 1391.101354
At x = 7.500000, y = 1968.636581
At x = 8.000000, y = 2699.985683
At x = 8.500000, y = 3608.514680
At x = 9.000000, y = 4719.089595
At x = 9.500000, y = 6058.076448
At x = 10.000000, y = 7653.341262
```

Secant Method to find roots:

Code:

```
%Secant Method root search
p = [-7.5 -6.5]; %array of p values with the 2 initial values
i = 2 %start with p0 and p1
maxIteration = 15;
epsilon = 0.0001;

while i <= maxIteration
   y = f1(p(i));
   fprintf('iteration %f p=%f y=%f\n', i, p(i), y);
   newval = p(i) - (f1(p(i))*(p(i)-p(i-1))/(f1(p(i)) - f1(p(i-1))));
   if abs(newval - p(i)) < epsilon %check if desired accuracy is met
      fprintf('Answer found:%f with f(x)=%f\n',newval, f1(newval));
      break;
   end;
   p = [p newval];
   ++i;
end;
```

Output: (each section is running the secant method with different bounds)

```
iteration 2.000000 p=-6.500000 y=-332.648461
iteration 3.000000 p=-6.918955 y=-62.111184
iteration 4.000000 p=-7.015140 y=11.974975
iteration 5.000000 p=-6.999593 y=-0.320076
iteration 6.000000 p=-6.999998 y=-0.001578
Answer found:-7.000000 with f(x)=0.000000

iteration 2.000000 p=1.000000 y=0.428924
iteration 3.000000 p=0.990145 y=0.140084
iteration 4.000000 p=0.985366 y=-0.001905
Answer found:0.985430 with f(x)=0.000008
```

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iteration 2.000000 p=3.000000 y=-0.803596
iteration 3.000000 p=2.857451 y=-0.729715
iteration 4.000000 p=1.449520 y=8.418472
iteration 5.000000 p=2.745146 y=-0.182636
iteration 6.000000 p=2.717634 y=0.004620
iteration 7.000000 p=2.718313 y=-0.000224
Answer found:2.718282 with f(x)=-0.000000

iteration 2.000000 p=3.500000 y=7.397418
iteration 3.000000 p=3.048994 y=-0.635033
iteration 4.000000 p=3.084650 y=-0.441649
iteration 5.000000 p=3.166080 y=0.243087
iteration 6.000000 p=3.137171 y=-0.040397
iteration 7.000000 p=3.141291 y=-0.002790
iteration 8.000000 p=3.141597 y=0.000037
Answer found:3.141593 with f(x)=-0.000000