**Chapter 4**

**Applications of Derivatives**

**4.9 Newton’s Method**

**Section Exercises**

**For the following exercises, write Newton’s formula as for solving**

407. 

Answer: 

409. 

Answer: 

**For the following exercises, solve using the iteration which differs slightly from Newton’s method. Find a  that works and a  that fails to converge, with the exception of **

411. , with

Answer: fails,  works

413. What is the value of “” for Newton’s method?

Answer: 

**For the following exercises, start at**

* 1. **and**
  2. ****

**Compute and using the specified iterative method**.

415. 

Answer: a.  b. 

417. 

Answer: a.  b. 

419. 

Answer: a.  b. 

421. 

Answer: a. b. 

**For the following exercises, solve to four decimal places using Newton’s method and a computer or calculator. Choose any initial guessthat is not the exact root.**

423. 

Answer: 

425. 

Answer:

427. choose 

Answer: 

429. 

Answer:

431. 

Answer: 

**For the following exercises, use Newton’s method to find the fixed points of the function where round to three decimals.**

433.  on

Answer:

435. 

Answer:

**Newton’s method can be used to find maxima and minima of functions in addition to the roots. In this case apply Newton’s method to the derivative function to find its roots, instead of the original function. For the following exercises, consider the formulation of the method.**

437. What additional restrictions are necessary on the function ?

Answer: We need to be twice continuously differentiable.)

**For the following exercises, use Newton’s method to find the location of the local minima and/or maxima of the following functions; round to three decimals.**

439. Minimum of 

Answer: 

441. Maximum of 

Answer: 

443. Maximum of 

Answer:

445. Minimum of 

Answer:

**For the following exercises, use the specified method to solve the equation. If it does not work, explain why it does not work**.

447. Newton’s method,

Answer: There is no solution to the equation.

449. Solvingstarting at

Answer: It enters a cycle.

**For the following exercises, use the secant method, an alternative iterative method to Newton’s method. The formula is given by**



451. Find a root to accurate to four decimal places.

Answer: 

453. Find a root to accurate to four decimal places.

Answer:

**For the following exercises, use both Newton’s method and the secant method to calculate a root for the following equations. Use a calculator or computer to calculate how many iterations of each are needed to reach within three decimal places of the exact answer. For the secant method, use the first guess from Newton’s method.**

455. 

Answer: Newton: iterations, secant: iterations

457. 

Answer: Newton: three iterations, secant: six iterations

459. 

Answer: Newton: five iterations, secant: eight iterations

**In the following exercises, consider Kepler’s equation regarding planetary orbits, where is the mean anomaly, is eccentric anomaly, and  measures eccentricity.**

461. Use Newton’s method to solve for the eccentric anomaly  when the mean anomaly and the eccentricity of the orbit round to three decimals.

Answer: 

**The following two exercises consider a bank investment. The initial investment is After  years, the investment has tripled to**

463. Use Newton’s method to determine the interest rate if the interest was compounded continuously.

Answer:

**Student Project**

**Iterative Processes and Chaos**

1. Let and choose Either by hand or by using a computer, calculate the first values in the sequence. Does the sequence appear to converge? If so, to what value? Does it result in a cycle? If so, what kind of cycle (for example,.)?

Answer: Converges to 0

3. For  and calculate the first  sequence values. Generate a cobweb diagram for each iterative process. (Several free applets are available online that generate cobweb diagrams for the logistic map.) What is the long-term behavior in each of these cases?

Answer:  yields a 2-cycle. yields a 4-cycle.

5. Repeat the process for  but let  How does this behavior compare with the behavior for

Answer: Changing the initial condition to  changes the sequence values fairly drastically. By the 9th or 10th iteration the values are more than 0.5 apart.

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