4.3: Optimization

1. What is the definition of a critical point?
2. Where can a continuous function on a closed interval assume its maximum and minimum values? State the Extreme Value Theorem.
3. What is an objective function?
4. What is the constraint equation?
5. Summarize how to solve a max/min problem.

Homework: 4.3: 7, 15, 22, 26, 28, 30 (extra credit)

4.4 Parametric Equations, Parametric Curves

1. Explain, in your own words, what a parameter and a parametric curve are.
2. Give parametric equations for the circle $x^2 + y^2 = 1$.
3. Explain, in your own words, what eliminating the parameter means.
4. Is it possible to have different parametric equations describe the same curve? Explain.
5. What is the formula for the slope of a parametric curve?

Homework 4.4: 1-4, 6, 11, 18, 20
Hand in: 4.4: 1-4, 6, 11, 18 (for extra credit: 20)

4.5: Related Rates

1. What is a related rate? Summarize the underlying idea.
2. Give some examples of the favorite formulas that authors love to use.
3. What does it mean for two triangles to be similar?
4. Read through example 5 very carefully. Summarize the key points.
   Namely, what are the variables? What equation is used to relate the variables?
   What rates are known? What rates are unknown? What is the outcome?

Homework: 4.5: 4 – 6, 8, 9, 11, 12, 16, 17, 19, 21, 26 (this uses a piecewise-function and it trickier), 27
Hand in: 4.5: 4, 10, 11, 12, 16, 22, 26, 27

4.6: Newton’s Method: Finding Roots

1. What is a root of an equation?
2. Graphically illustrate one step in Newton’s method. (ok you can't use e-mail for this - just hand in a picture in class)
3. What is Newton’s iteration formula?
4. When can Newton’s formula not work? Give two examples of what can go wrong.

Homework: 4.6: 1-3, 5, 6, 8, 9, 15, 16, 22
Hand in: 4.6: 2, 5, 6, 8, 15, 22
4.2: More on Limits: Limits Involving Infinity

1. There are two types of limits involving infinity in this section: limits at infinity and infinite limits. One of these types corresponds to horizontal asymptotes; the other corresponds to vertical asymptotes. Which is which? Give the formal definitions of each.
2. Can polynomials have vertical or horizontal asymptotes? Explain your answer.
3. Infinity is a tricky thing. It is not a number. It is a concept. What are the good and bad uses of infinity?
4. How do you find vertical and horizontal asymptotes for a rational function?
5. Do you agree with the authors when they claim that some limits are “obvious”? Which limits do they feel are obvious? How would you explain these limits to someone who was not in the course?
6. In what two indeterminate forms can a limit be in order to use l’Hopital’s rule?

Homework: 4.2: 3 – 8, 9 – 16, 26, 28, 30, 42, 44, 45, 47 – 50, 55 - 81
Hand in: 4.2: 4, 6, 8, 10, 12, 14, 16, 20, 26, 28, 30, 42, 44, 48, 60, 62, 81

4.8 Why Continuity Matters

1. What does the Intermediate Value Theorem state?
2. What does the Extreme Value Theorem state?
3. How does the bisection algorithm find roots of an equation? How does it use the Intermediate Value Theorem?
4. In order to be able to use a theorem, the hypotheses must be true. Can the conclusion of a theorem still be true even if the hypotheses don’t hold? Give an example using either the IVT or the EVT.

Homework: 4.8: 1, 2, 7, 8, 9, 10, 12, 14, 16, 17, 18, 19, 22 – 25, 26, 27, 35 – 38
Hand in: 4.8: 1, 2, 7 – 10, 12, 14, 16, 18, 22, 26, 27, 36

4.9 Why Differentiability Matters; The Mean Value Theorem

1. The authors prove that if a function is differentiable at a point, then it is also continuous at that point. How do they do it?
2. State, in your own words, the Mean Value Theorem.
3. Draw a picture to represent the Mean Value Theorem.
4. Theorem 11 uses the Mean Value Theorem to show that if a function’s derivative is zero, then the function must be constant. Read the proof and write it in your own words.
5. What does Rolle’s Theorem state?
6. Explain what the function l is in the proof of the Mean Value Theorem.

Homework 4.9: 1-6, 15-18, 19, 20-22, 23, 28, 30, 33
Hand in 4.9: 4, 6, 15 – 18, 19, 20, 28, 33