

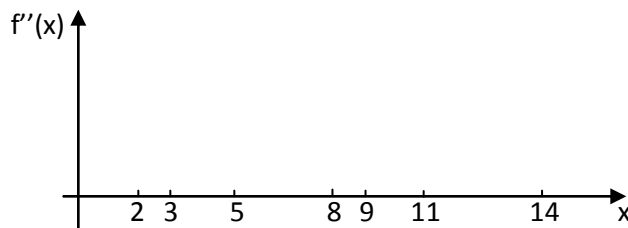
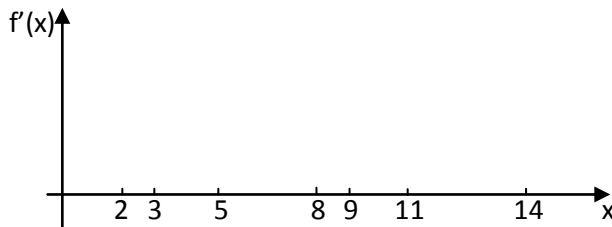
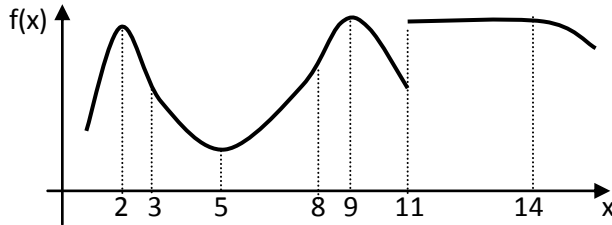
Math 1170
Midterm 2 Practice problems

Please, keep in mind that the test may include any of the material that we encountered in class/homeworks, even if it does not directly appear in the practice problems.

The midterm will cover material that we discussed in clas from sections 1.7, 2.1-2.9, 3.1, 3.2

1. Function $f(x)$ is given with a graph below.

a) Sketch graphs of derivative and second derivative of $f(x)$ in the spaces provided



- b) What are the critical points? Points of inflection?
- c) Is this function continuous or discontinuous?
- d) On which intervals does the function increasing? decreasing? constant?
concave up? concave down?

2. Find the derivatives of the following functions:

a) $g(t) = 10e^{3x}$

b) $h(s) = (5s^2 - 1)/(3s - 2)$

3. Find second derivative of $f(w) = \ln(w)$

4. Consider the following dynamical system:

$$x_{n+1} = x_n^2$$

a) Find the steady states and their stability algebraically, using the updating function and its derivative

b) What do you think will happen to the solution which starts with $x_0 = 0.5$, if we wait for a long time?

5) The length of an insect (L , in millimeters) is a function of the temperature during development (T , measured in degrees Celcius) according to $L(T) = 10 + T/10$. The volume of the bug (V , in cubic millimeters) is a function of the length according to $V(L) = 2L^3$. The mass (M , in milligrams) depends on the volume according to $M(V) = 1.3V$.

a) Find the derivative of M as a function of T

b) Will the insect be gaining or losing weight when the temperature is 10 degrees Celcius?

6) $s_{t+1} = -0.8s_t$

a) Find the equilibrium

b) Find the stability using the derivative of the updating function

c) Do cobwebbing starting with $s_0 = 0.5$ up to $t = 4$

d) Plot the solution that you found by cobwebbing as a function of time

e) What will happen to the solution if we wait for a long time?

7) The following is true for the population of annual plants:

- w_t is the fraction of plants with white flowers in year t

- all other plants have yellow flowers

- a plant with white flowers will produce 2 seeds that will grow into plants the following year

- a plant with yellow flowers will produce 3 seeds that will grow into plants the following year

What will be the fraction of white flowers the following year?