

MATH 106 CALCULUS I FOR BIO. & SOC. SCI. FALL 2012

INSTRUCTOR: NITU KITCHLOO

Homework 7.

Please show all your work.

- (1) Consider the function $f(x) = \sqrt{2x+2}$. Use a suitable the linear approximation on the function $f(x)$ to estimate $\sqrt{4.2}$.
- (2) Suppose that

$$w(x) = \frac{x^2}{x^2 + 1}.$$

Find the intervals where $w(x)$ is increasing, decreasing, concave up and concave down.

- (3) Consider the function $g(x) = xe^{-2x^2}$.
 - (a) Find where the function $g(x)$ is increasing and where it is decreasing.
 - (b) Find where the function $g(x)$ is concave up and where it is concave down.
 - (c) Find the points on the graph of $g(x)$ where it has a local maximum and where it has a local minimum.
 - (d) Find the inflection points on the graph of $g(x)$.
- (4) Sketch the graph of a function $h(x)$ defined on the interval $(0, 3]$ such that
 - $h(x)$ does not have an absolute maximum on the interval $(0, 3]$.
 - $h(x)$ does not have a local maximum on the interval $(0, 3]$.
 - $h(3) = -1$ is the absolute minimum of $h(x)$ on the interval $(0, 3]$.
 - h is concave down on the interval $(0, 1)$.
 - $h'(2) = 0$.
- (5) Suppose that $f(x)$ is a function twice differentiable (remember this means that both $f'(x)$ and $f''(x)$ exist). For this function we know that $f'(x) < 0$ for x in $(-1, 1)$ and $f'(x) > 0$ for x in the intervals $(-\infty, -1)$ and $(1, \infty)$. In addition, assume that f is concave down on the interval $(-\infty, 0)$ and concave up on the interval $(0, \infty)$. Finally, we know that $f(0) = 0$, $f(-1) = 1$ and $f(1) = -1$. Answer the following questions. If for a given question you don't have enough information to decide please say so. Please explain your answers.
 - (a) Which of the following quantities is bigger: $f(-2)$ or $f(-1)$?
 - (b) Which of the following quantities is bigger: 0 or $f(0.5)$?
 - (c) Which of the following quantities is bigger: 0 or $f(10)$?
 - (d) Which of the following quantities is bigger: $f(0)$ or $f(0.9)$?
 - (e) Which of the following quantities is bigger: $f'(-3)$ or $f'(-2)$?