

HOMWORK ASSIGNMENT #7

due in class on Friday, November 8

Student No: _____ Name (Print): _____

Note: All homework assignments are due in class one week after being assigned. They must be on standard $8\frac{1}{2} \times 11$ size paper and they must be stapled. Assignments which are not stapled will not be accepted. I will not bring a stapler to class. Please enter your student number and name (as it appears on the registrar's list) in the spaces above. SURNAME FIRST IN CAPITALS, and given name second. Please put your answers in the boxes (if provided) and submit these pages for your assignment.

1. Find the linearizations $L(x)$ of the following functions $f(x)$ near $x = 0$.

(a) $f(x) = \sqrt{25 + x^2} + x$.

(b) $f(x) = (1 - 2x)^\beta$, where β is some constant.

(c) $f(x) = \ln(x + \sqrt{1 - x^2})$.

2. Two towns on the trans Canada Hiway are 100 *km* apart. Two cars leave the first town at 1:00 pm and both arrive at the second town one hour later. Show that at sometime between 1:00 pm and 2:00 pm they had the same velocity.

3. Find the length of the longest ladder that can be carried horizontally around a corner, from a corridor a m wide to one that is b m wide.

4. Let $f(x) = x^3 - 3x^2 + 1$, $-\infty < x < \infty$.

(a) Determine all critical points of $f(x)$.

(b) Determine all intervals of increase of $f(x)$.

(c) Determine all intervals of decrease of $f(x)$.

(d) Determine all intervals where $f(x)$ is concave up.

(e) Determine all intervals where $f(x)$ is concave down.

5. Let $f(x) = \frac{x^2 + 1}{x^2 + 2}$, $-\infty < x < \infty$.

(a) Determine all critical points of $f(x)$.

(b) Determine all intervals of increase of $f(x)$.

(c) Determine all intervals of decrease of $f(x)$.

(d) Determine all intervals where $f(x)$ is concave up.

(e) Determine all intervals where $f(x)$ is concave down.

6. Let $f(x) = \frac{e^x - 1}{e^{2x} + 1}$, $-\infty < x < \infty$.

(a) Determine all critical points of $f(x)$.

(b) Determine all intervals of increase of $f(x)$.

(c) Determine all intervals of decrease of $f(x)$.

7. Let $f(x) = \frac{\ln x}{x}$, $x > 0$.

(a) Determine all critical points of $f(x)$.

(b) Determine all intervals of increase of $f(x)$.

(c) Determine all intervals of decrease of $f(x)$.

(d) Determine all intervals where $f(x)$ is concave up.

(e) Determine all intervals where $f(x)$ is concave down.

8. Use implicit differentiation to find $\frac{dy}{dx}$ for the following:

(a) $\frac{\arcsin x}{\pi} + y^2 = \frac{7}{6}$.

(b) $\arctan(x^2) + \arctan y = \frac{7\pi}{12}$.

(c) $x^3 + y^3 = 6xy - 3$

(d) $xy = e^{-y^2+y}$.

9. Find the equation of the tangent lines for each of the curves in question 8, at the given point (a, b) .

(a) $(a, b) = (1/2, 1)$.

(b) $(a, b) = (-1, \sqrt{3})$.

(c) $(a, b) = (2, 1)$.

(d) $(a, b) = (1, 1)$.

10. Show that $\cos x > 1 - \frac{1}{2}x^2$ for $x > 0$.

11. Show that $\arcsin x = \arctan \frac{x}{\sqrt{1-x^2}}$.