
HOMEWORK 6

1. Compute the first derivative of the following functions

i) $f(x) = \frac{2x}{1-x^2}$

vi) $f(x) = x\sqrt{1+x^2}$

ii) $f(x) = \frac{\sqrt{x}}{1+x}$

vii) $f(x) = \frac{1}{\tan(x)}$

iii) $f(x) = \frac{\cos(x)}{2x^2+3}$

viii) $f(x) = e^{\sqrt{x}}$

iv) $f(x) = e^{-3x}(x^2 + 2x - 1)$

ix) $f(x) = \sin^3(x)$

v) $f(x) = e^{2x}(2\sin(3x) - 4\cos(3x))$

x) $f(x) = \exp\left(\frac{x^3-1}{x^2+5}\right)$

2. Let $f(x)$ be a differentiable function such that $f(1) = 2$ and $f'(1) = 1$. Let $g(t)$ be another differentiable function such that $g(0) = 1$ and $g'(0) = 3$. Compute $h'(0)$, where $h(t) = f(g(t))$.

3. A book publisher has a cost function given by $C(x) = \frac{x^3+2x+3}{x^2}$, where x is the number of copies in thousands and $C(x)$ is the cost in dollars per book. The publisher produces now 2000 copies of a book. Decide whether the publisher should increase or decrease the production.

4. Garfield loves lasagna. Let $W(t)$ be Garfield's weight in pounds as a function of time (in weeks).

(a) What are the units of $W'(t)$?

(b) Suppose that $W'(10) = 2$. What can you say about Garfield's weight?

(c) Jon decides that Garfield is eating too much lasagna and needs to go on a diet. He says : "for Garfield, the goal of a diet isn't losing weight, it's slowing down the gain". How would you express this concept using $W'(t)$ or $W''(t)$?

5. Find the equation of the line tangent to the circle $x^2 + y^2 = 4$ at the point $(1, \sqrt{3})$.

6. Find a polynomial $P(x)$ of degree three such that $P(0) = P(1) = -2$, $P'(0) = -1$ and $P''(0) = 10$.