

Math-250: Survey of Calculus
Section 6
Midterm Exam 1

Name: _____

ULID: _____

Please write complete step by step solutions to the problems below.

1. An entrepreneur is starting his business of selling tacos. He pays \$1000 to start up his taco stand. He calculates that the cost of making one taco for his customers is \$1.50. He sells the tacos for \$4 each.

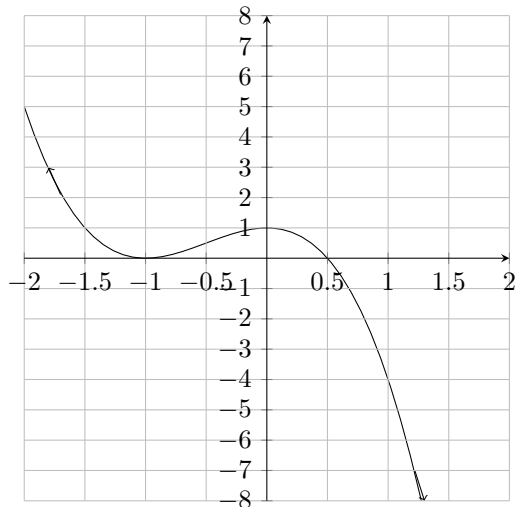
- (a) Give the cost function for this business

- (b) Give the revenue function for this business

- (c) Give the profit function for this business

- (d) How many tacos does he have to sell to make a profit of \$500.

2. For a graph of $f(x)$ given:



- (a) For what values of x is $f(x)$ increasing?

- (b) For what values of x is $f(x)$ decreasing?

- (c) For what values of x is $f(x)$ concave up?

- (d) For what values of x is $f(x)$ concave down?

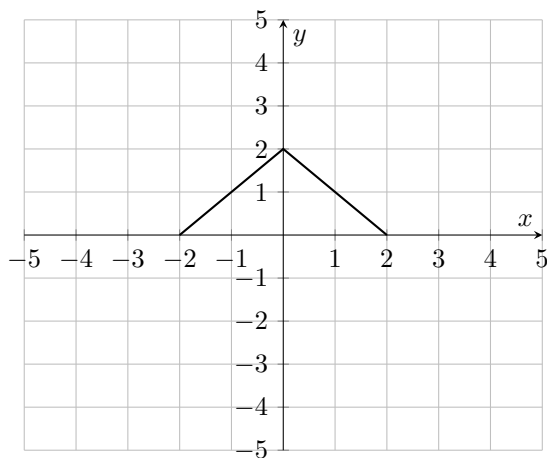
3. Find the average rate of change of $f(x) = x^2 - 1$ between $x = -1$ and $x = 4$.
4. Food bank usage in Britain has grown dramatically over the past decade. The number of users, in thousands, of the largest food bank in year t is estimated to be $N(t) = 1.3e^{0.81t}$, where t is the number of years since 2006.
- (a) What does the 1.3 represent in this context? Give units
 - (b) What is the continuous growth rate of users per year?
 - (c) What is the annual percent growth rate of users per year?
 - (d) Find the doubling time.
5. The circulation time of a mammal (that is, the average time it takes for all the blood in the body to circulate once and return to the heart) is proportional to the fourth root of the body mass of the mammal.
- (a) Write a formula for the circulation time, T , in terms of the body mass, B .
 - (b) If an elephant of body mass 5230 kilograms has a circulation time of 148 seconds, find the constant of proportionality.

6. For the functions $f(x) = x - 2$ and $g(x) = x^2 + 8$, find the following composite functions.

(a) $f(g(x))$

(b) $g(f(x))$

7. Refer to the graph of $y = f(x)$ in the accompanying figure to sketch the graph of $y = f(x + 2) + 1$



8. If \$10,000 is deposited in an account paying 8% interest per year, compounded annually, how long will it take for the balance to reach \$30,000.