1. Let \( f(x) = 4 + \frac{2x}{x^2 + 3} \). Find and identify each of the following (if they exist):

a. domain of \( f \)
b. intercepts of \( f \)
c. local maximum points of the graph of \( f \)
d. local minimum points of the graph of \( f \)
e. intervals on which the graph of \( f \) is increasing
f. intervals on which the graph of \( f \) is decreasing
g. intervals on which the graph of \( f \) is concave up
h. intervals on which the graph of \( f \) is concave down
i. inflection points of the graph of \( f \)
j. vertical asymptotes to the graph of \( f \)
k. horizontal asymptotes to the graph of \( f \)

Then, incorporating all of the above information into a sketch the graph of \( f \).

2. Do four (4) of the following: Find the following limits (if they exist):

a. \( \lim_{x \to \infty} \frac{(3x - 5)(x + 6)}{(2x + 4)(2x + 1)} \)

b. \( \lim_{x \to 0} \frac{x \sin x}{1 - \cos x} \)

c. \( \lim_{x \to 0} \frac{x^2}{\sin x} \)

d. \( \lim_{x \to 0} x \ln \frac{1}{2x} \)

e. \( \lim_{x \to 0} \frac{1}{\sin x} - \frac{1}{\tan x} \)

3. Find the area the largest rectangle, with base on the \( x \)-axis, which can be inscribed inside the triangle with vertices \((-8,0), (8,0), (0,4)\). See picture.

4. Westel Corporation manufactures telephones and has developed a new cellular phone. Production analysis show that its price must not be set at less than $70. Also, if \( x \) units are sold, then the optimal price is given by the formula \( p(x) = 200 - x \). The total cost for producing \( x \) units is given by the formula \( C(x) = 2500 + 50x \). Find the maximum profit and determine the price that should be charge to achieve that profit.
5. Do four (4) of the following: Find the following indefinite integrals:

a. \[ \int (3 + 4x) \, dx \]

b. \[ \int \sin x \, dx \]

b. \[ \int \sqrt{x} \left(1 - \frac{1}{x^3}\right) \, dx \]

d. \[ \int \left(\frac{4}{\sqrt{x}} + \frac{4}{\sqrt{1-x^2}}\right) \, dx \]

e. \[ \int (4 + 3x)^2 \, dx \]