

Answer the problems on **separate** paper. You do not need to rewrite the problem statements on your answer sheets. Do your own work. **Show all relevant steps** which lead to your solutions. Attach this question sheet to the front of your answer sheets.

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

- domain of f
- intercepts of f
- local maximum points of the graph of f
- local minimum points of the graph of f
- intervals on which the graph of f is increasing
- intervals on which the graph of f is decreasing
- intervals on which the graph of f is concave up
- intervals on which the graph of f is concave down
- inflection points of the graph of f
- vertical asymptotes to the graph of f
- 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. $\lim_{x \rightarrow \infty} \frac{(2x-5)(x+4)}{(5x+4)(2x+1)}$

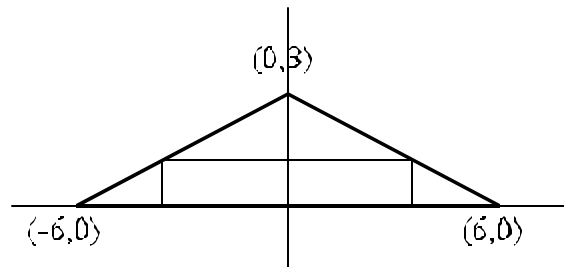
b. $\lim_{x \rightarrow 0} \frac{x \cos x}{x + \cos x}$

c. $\lim_{x \rightarrow 0^+} \frac{\sin x^2}{\sin^2 x}$

d. $\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x^2}$

e. $\lim_{x \rightarrow 0} \frac{1}{\sin 3x} - \frac{1}{3x}$

3. Find the area the largest rectangle, with base on the x -axis, which can be inscribed inside the triangle with vertices $(-6,0)$, $(6,0)$, $(0,3)$. 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 \$50. Also, if x units are sold, then the optimal price is given by the formula $p(x) = 150 - x$. The total cost for producing x units is given by the formula $C(x) = 2500 + 30x$. 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. $\int (6 - 7x) dx$

b. $\int \frac{dx}{\cos^2 x}$

b. $\int x(1 + \frac{1}{x^3}) dx$

d. $\int (\frac{4}{x} - \frac{4}{\sqrt{1-x^2}}) dx$

e. $\int (2 - 3x)^2 dx$