

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. Consider the function $y = \sqrt{2x+9}$.
 - a. (9 pts) Construct a linearization for the function at $x = 8$.
 - b. (6 pts) Use the linearization constructed in part a. to construct an approximation for the value of $\sqrt{25.2}$

2. (12 pts) Using calculus, find the absolute maximum and absolute minimum values of $f(x) = 3x^4 + 8x^3 - 18x^2 + 5$ on the interval $[-1, 2]$

3. (45 pts) Let $f(x) = -\frac{4x+1}{(3x+1)^2}$. Find and identify each of the following (if they exist) – *record your solutions to parts a. through m. on the back of this page.*
 - a. domain of f
 - b. intercepts of f
 - c. vertical asymptotes to the graph of f
 - d. horizontal asymptotes to the graph of f
 - e. critical numbers of f
 - f. intervals on which the graph of f is increasing
 - g. intervals on which the graph of f is decreasing
 - h. local maximum points of the graph of f
 - i. local minimum points of the graph of f
 - j. 2nd order critical numbers of f
 - k. intervals on which the graph of f is concave up
 - l. intervals on which the graph of f is concave down
 - m. inflection points of the graph of f

Then, incorporate all of the above information into a sketch the graph of f .

4. (30 pts) Find the following limits (if they exist):

a. $\lim_{x \rightarrow \infty} \frac{2x^3 - x^{3/2} + 3}{3x^3 + 4x - 1}$

b. $\lim_{x \rightarrow 0} \frac{\sin^2 x}{\cos 2x - 1}$

c. $\lim_{x \rightarrow 0} \frac{x \tan x}{1 + \cos x}$

d. $\lim_{x \rightarrow \infty} \sqrt{x} e^{-x}$

e. $\lim_{x \rightarrow \infty} (x^2 + 1)^{1/x}$

Solution Space for Problem 3

	Problem Statement	Problem Solution
a	domain of f	
b	intercepts of f	
c	vertical asymptotes to the graph of f	
d	horizontal asymptotes to the graph of f	
e	critical numbers of f	
f	intervals on which the graph of f is increasing	
g	intervals on which the graph of f is decreasing	
h	local maximum points of the graph of f	
i	local minimum points of the graph of f	
j	2 nd order critical numbers of f	
k	intervals on which the graph of f is concave up	
l	intervals on which the graph of f is concave down	
m	inflection points of the graph of f	