

Instructions:

- Attempt all questions.
- The test is out of 100 marks.
- There are 10 questions, 10 marks each.
- You have 60 minutes to complete the test.
- You may use calculators on this test.

Advice:

- Budget your time.
 - Do questions which you know how to do immediately first.
 - Leave questions which you find difficult until last.
 - Ask for clarification if you do not understand a question.
 - You must show your work. Label sketches well.
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Problem 1. (10 marks) For the quadratic function $f(x) = 14x^2 - 2x + 3$, convert to the vertex form $f(x) = a(x - h)^2 + k$ by completing the square. Identify the vertex and axis of symmetry for this quadratic function. You must use completing the square in this problem.

Problem 2. (10 marks) Given $f(x) = \frac{1}{x+1}$, simplify the quantity $\frac{f(x+h) - f(x)}{h}$ as much as possible. You should simplify until substituting zero for h will not yield an indeterminate form.

Problem 3. (10 marks) Find the remainder $r(x)$ when $g(x) = -4x^3 - 2x + 3$ is divided by $d(x) = 2x - 8$ using long division of polynomials.

Problem 4. (10 marks) Sketch the polynomial $f(x) = (3x - 1)^2(2 - x)^3$ by hand. Show all your work.

Problem 5. (10 marks) For the function $g(x)$ given below, determine what monomial the function approaches for large $|x|$. Then, evaluate $\lim_{x \rightarrow \infty} g(x)$ and $\lim_{x \rightarrow -\infty} g(x)$. Does the function $g(x)$ have any horizontal asymptotes?

$$g(x) = \frac{(-3x^3 + 24x - 78)(-x + 1)}{2x^3 - 99}$$

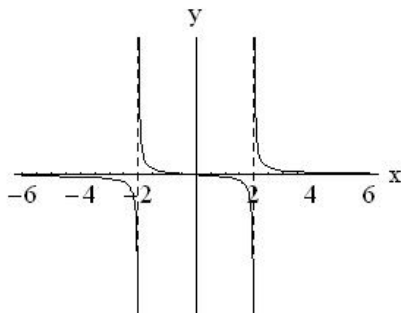
Problem 6. (10 marks) Sketch the rational function $h(x) = \frac{(x + 6)^3}{2(x^2 - 4)}$ by hand (find x -intercepts, vertical asymptotes, slant or horizontal asymptotes, and end behaviour).

Problem 7. (10 marks) Solve the inequality $\frac{(3x + 5)|x - 2|}{x - 5} < 0$ by constructing a sign chart. Show your work.

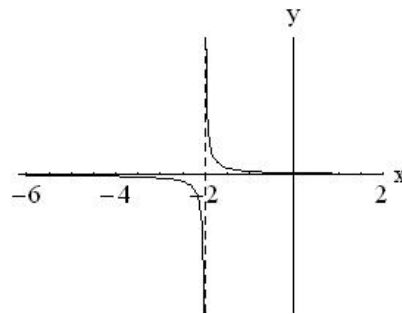
Problem 8. (10 marks) Solve the inequality $\frac{1}{x + 2} + \frac{1}{x - 2} \leq 0$ by constructing a sign chart, or drawing an appropriate sketch by hand. Show all your work. *Hint:* Simplify first to get a rational function on the left hand side.

Problem 9. (10 marks) Solve $\frac{3x}{x+1} + \frac{5}{x-2} = \frac{15}{x^2-x-2}$ for x .

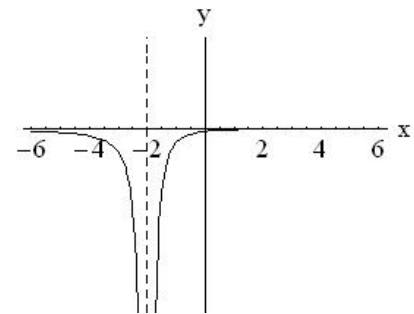
Problem 10. (10 marks) Match the graph to the function.



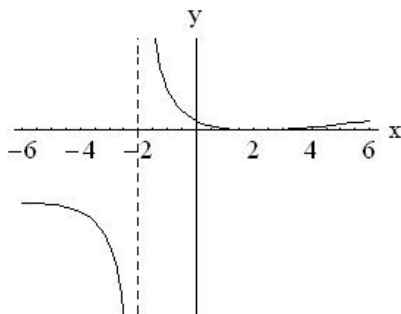
Function:-----



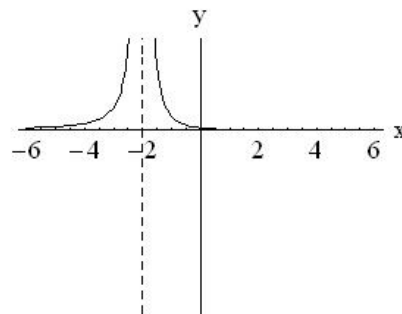
Function:-----



Function:-----



Function:-----



Function:-----

A) $y = \frac{1}{x^2 + 4}$

B) $y = \frac{2x}{(x-2)(x+2)}$

C) $y = \frac{x-2}{(x+2)^2}$

D) $y = \frac{1}{x+2}$

E) $y = \frac{(x-2)^2}{x+2}$

F) $y = \frac{2-x}{(x+2)^2}$