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VCE Specialist Mathematics ½
Modulus & Partial Fractions [1.1]
Homework

Homework Outline:

Compulsory Questions	Pg 2 - Pg 18
Supplementary Questions	Pg 19 - Pg 30

Section A: Compulsory Questions

Sub-Section: Solving Simple Modulus Equations and Inequalities

Question 1

Evaluate:

a. $|-5|$

b. $-|-16|$

c. $|3^2 - 3 \times 2 + 9|$

Question 2

Solve the following equations for x.

a. $|x-2|=4$

b. $|2x-3|=5$

c. $|1-\sqrt{x}|=5$

Question 3

Solve the following equations for x.

a. $|x| < 3$

b. $|2x - 1| > 1$

c. $|3x| + 1 > 10$

Question 4 Tech-Active.

Solve the following equality for x.

$$\left|\sqrt{2x} - 1\right| = 3$$

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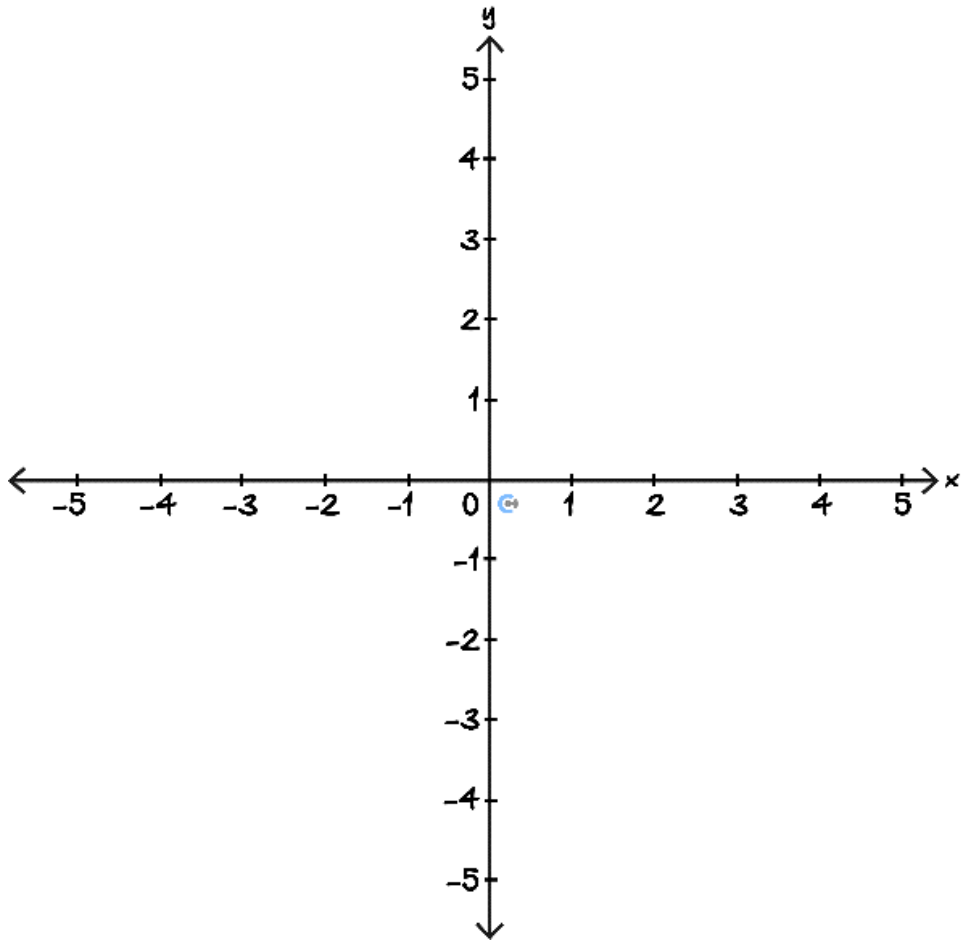
Sub-Section: Graphing Modulus Functions and Composite Modulus Functions

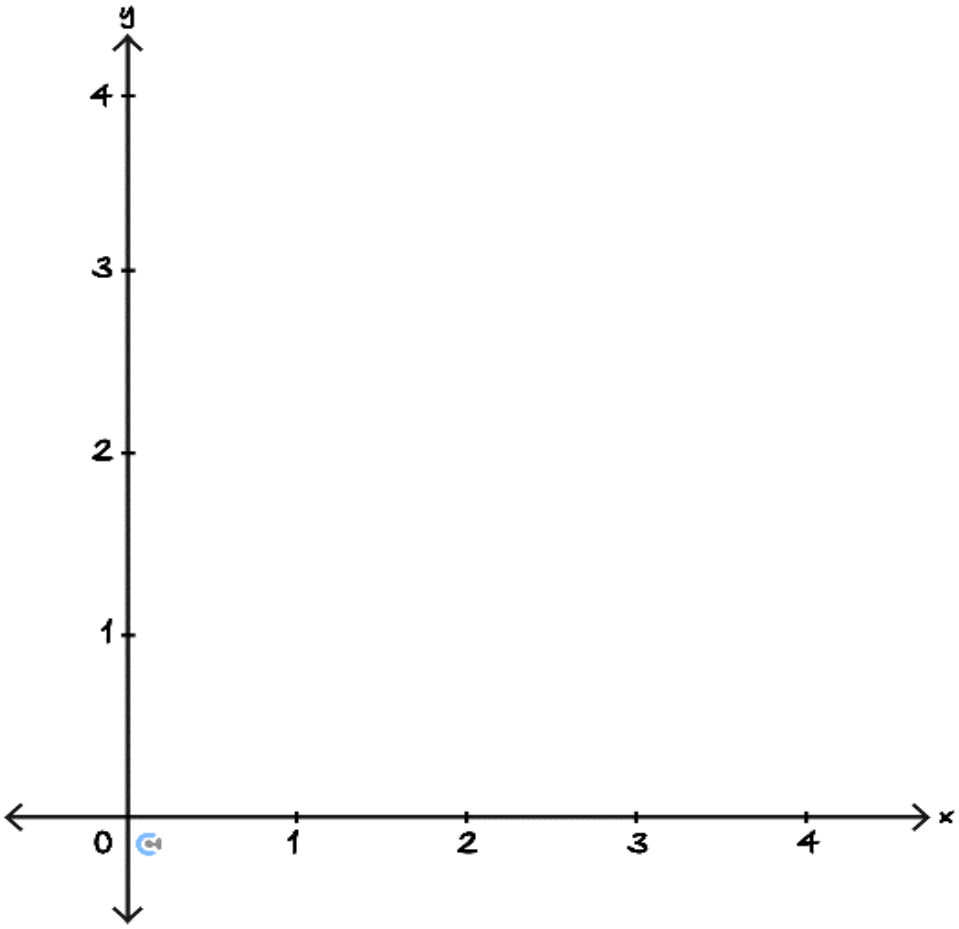
Question 5

Sketch the graph of the function $f(x) = 2|x - 1| - 4$ on the axes below. Label the axis intercepts and the vertex of the graph.



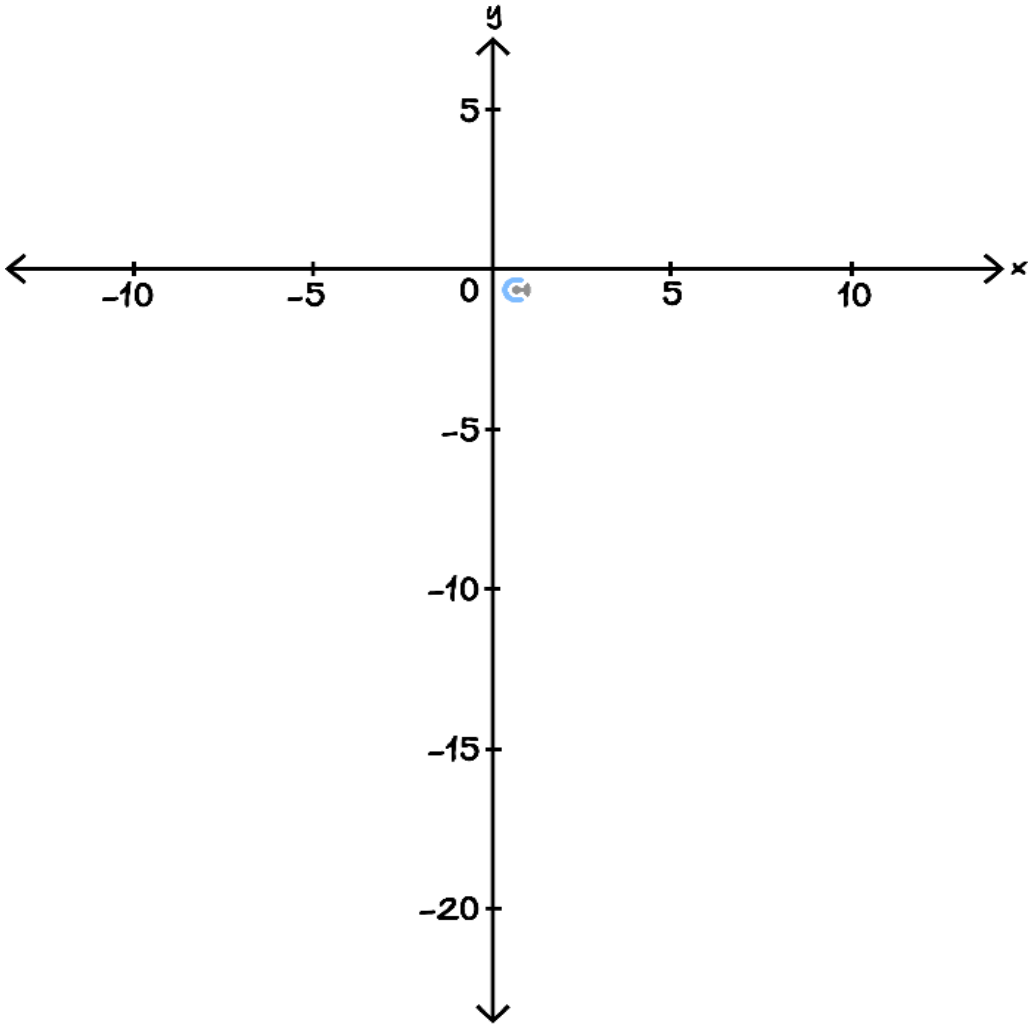
Question 6

Sketch the graph of the function $f(x) = |(x-2)(x-1)|$. Label any axis intercepts.



Question 7

Sketch the graph of the function $y = f(|x|)$ where $f(x) = x^2 - 5x - 14$. Label any axis intercepts.



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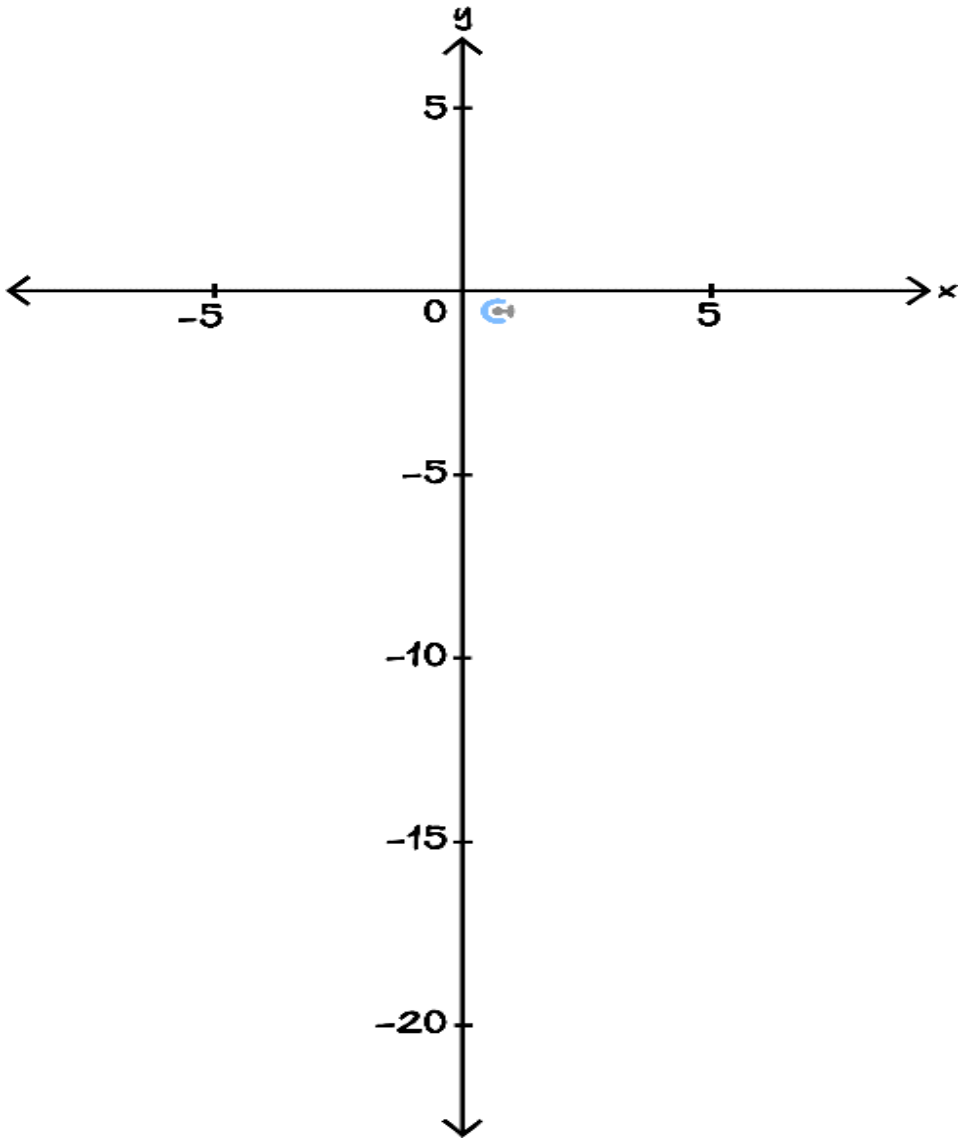
Question 8 Tech-Active.

Sketch the graph of the function $y = f(-|x|)$ where $f(x) = (x-5)(x+4)$.



Sub-Section: Apply Partial Fractions to Find a Decomposed Form

Question 9

Perform partial fraction decomposition to write the following functions in the form specified below.

a. $\frac{7x-8}{(x-1)(x-2)} = \frac{A}{x-1} + \frac{B}{x-2}$

b. $\frac{x^2-6}{(x-3)(x-2)^2} = \frac{A}{x-3} + \frac{B}{x-2} + \frac{C}{(x-2)^2}$

c. $\frac{9x+5}{(x+1)(x^2+3)} = \frac{A}{x+1} + \frac{Bx+C}{x^2+3}$

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Question 10

Perform partial fraction decomposition to the following functions.

a. $\frac{11x+19}{x^2+4x-5}$

b. $\frac{6x^2+x-2}{x^3-2x^2}$

c. $\frac{7x^2+x-2}{x^3-x^2}$

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Question 11

Perform partial fraction decomposition to the following functions.

a. $\frac{x^3-1}{x^2+2x-3}$

b. $\frac{2x^4-3x^3+5x^2-3x-2}{x^3-2x^2}$

c. $\frac{2x^3-x^2+5}{(x-1)^2}$

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Question 12 Tech-Active.

Perform partial fraction decomposition to the function $f(x) = \frac{x^4+3x^3+11x^2+9x+11}{(x-1)(x^2+2x+4)}$.

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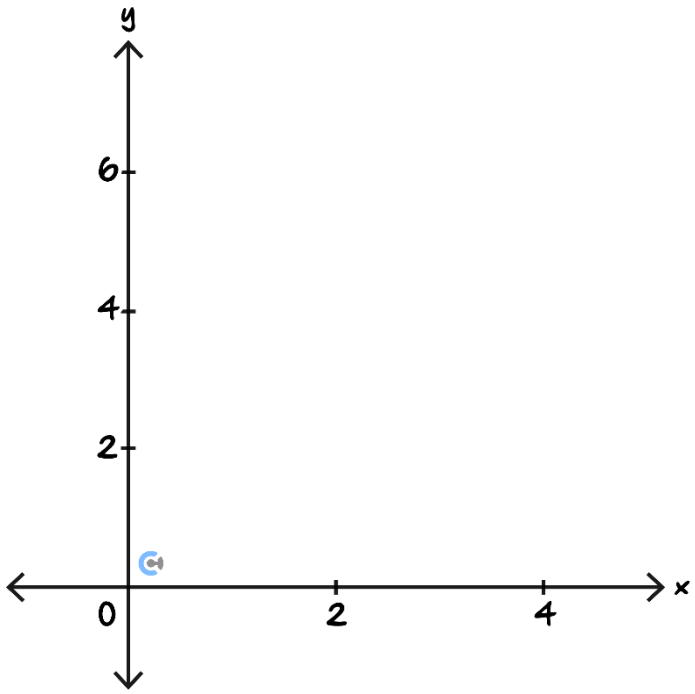
Sub-Section: The 'Final Boss'

Question 13

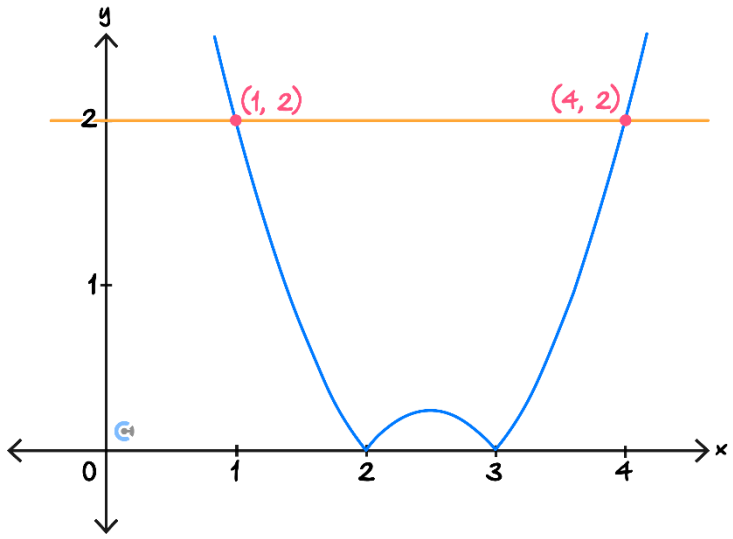
Consider the function $f(x) = x^2 - 5x + 6$.

a. Evaluate $|f(-2)|$ and $f(|-2|)$.

b. Sketch the graph of $y = |f(x)|$.



c. Solve for the values of x that satisfy the inequality $|f(x)| < 2$.



d. State the value of k, so that the equation $|f(x)| = k$ has three solutions.

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Section B: Supplementary Questions

Sub-Section: Solving Simple Modulus Equations and Inequalities

Question 14

Evaluate:

a. $-|-4|$

b. $|5|+|-6|$

c. $|-8|^2$

Question 15

Solve the following equations for x.

a. $|3-2x|=1$

b. $|x^2|=2$

c. $|x^2+1|=2$

Question 16

Solve the following equations for x.

a. $|-x| < 2$

b. $|2x - 1| > 5$

c. $|2x - 5| + 3 < 4$

Question 17

Consider the following equation $|x|^2 - 7|x| + 10 = 0$.

a. Before solving the equation, how many solutions do you expect this equation will have? Why?

b. Solve the equation.

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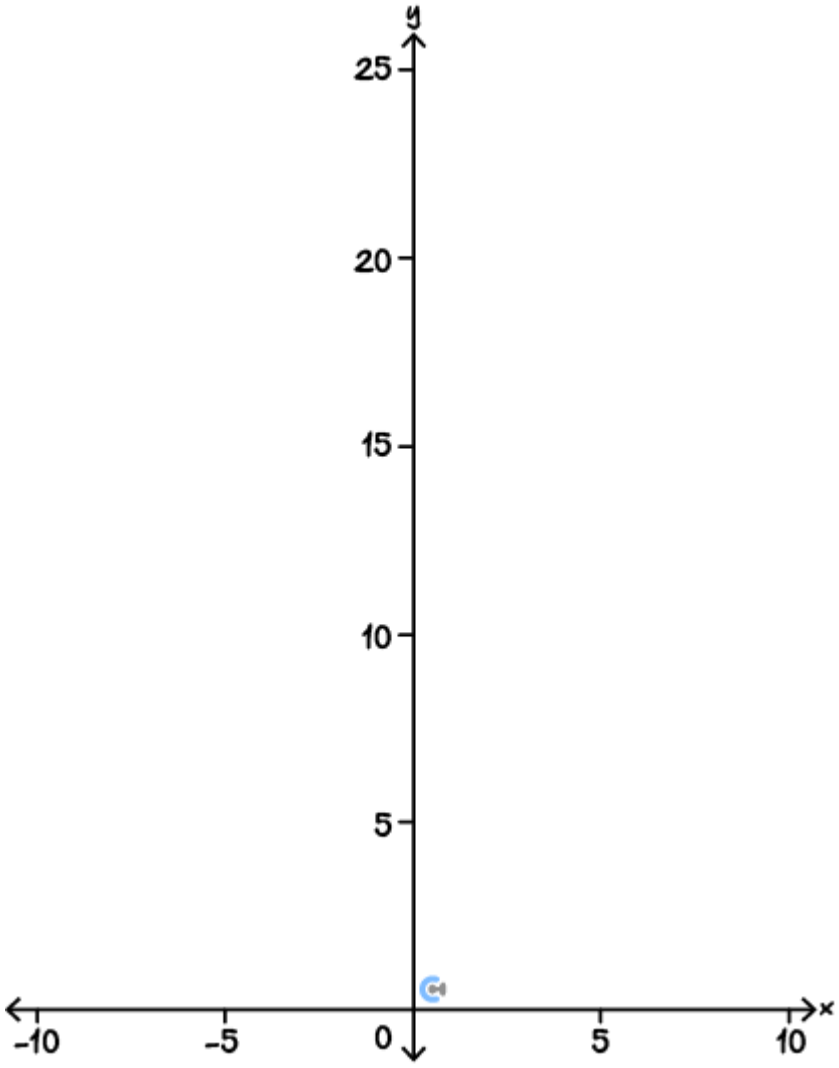
Sub-Section: Graphing Modulus Functions and Composite Modulus Functions

Question 18

Sketch the graph of the function $f(x) = 4|x - 1| + 12$ on the axes below. Label the axis intercepts and the vertex of the graph.



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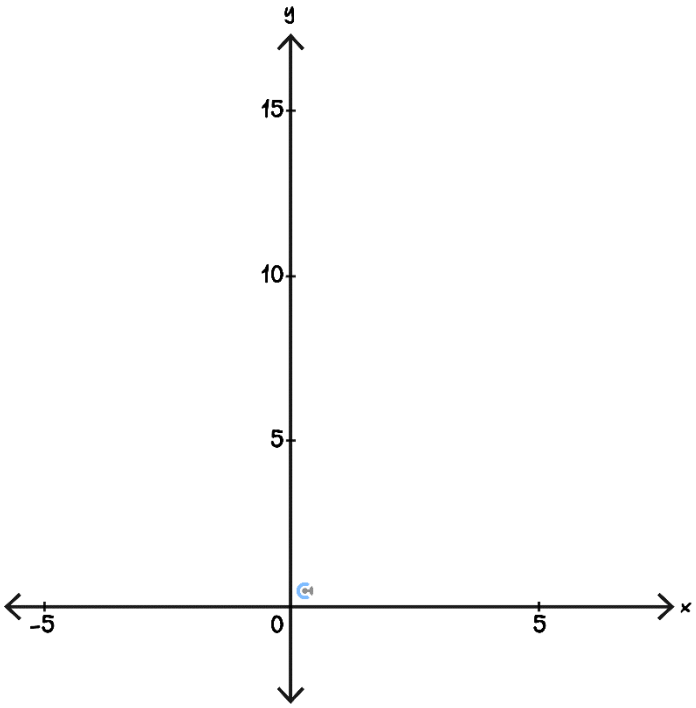
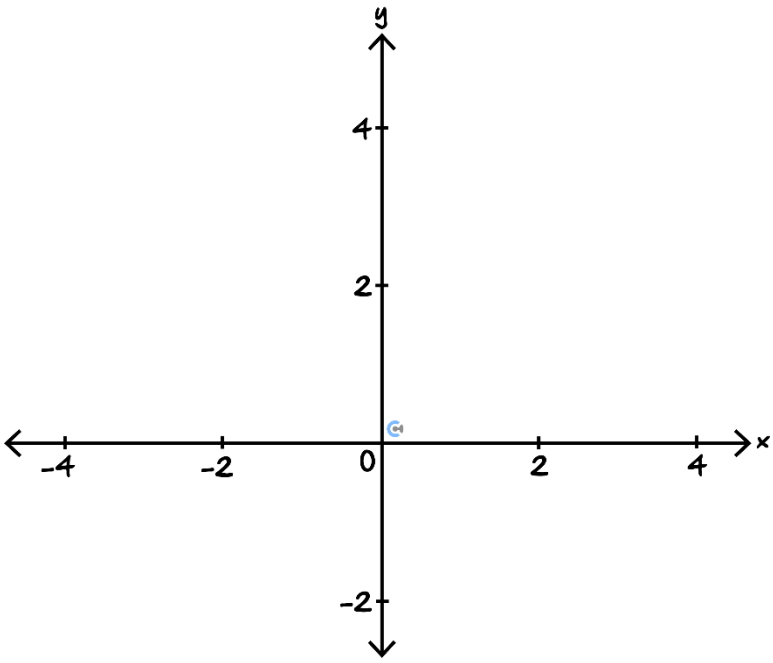
Question 19

Sketch the graph of the function $f(x) = |(x-2)(x+1)(x-5)|$. Label any axis intercepts.



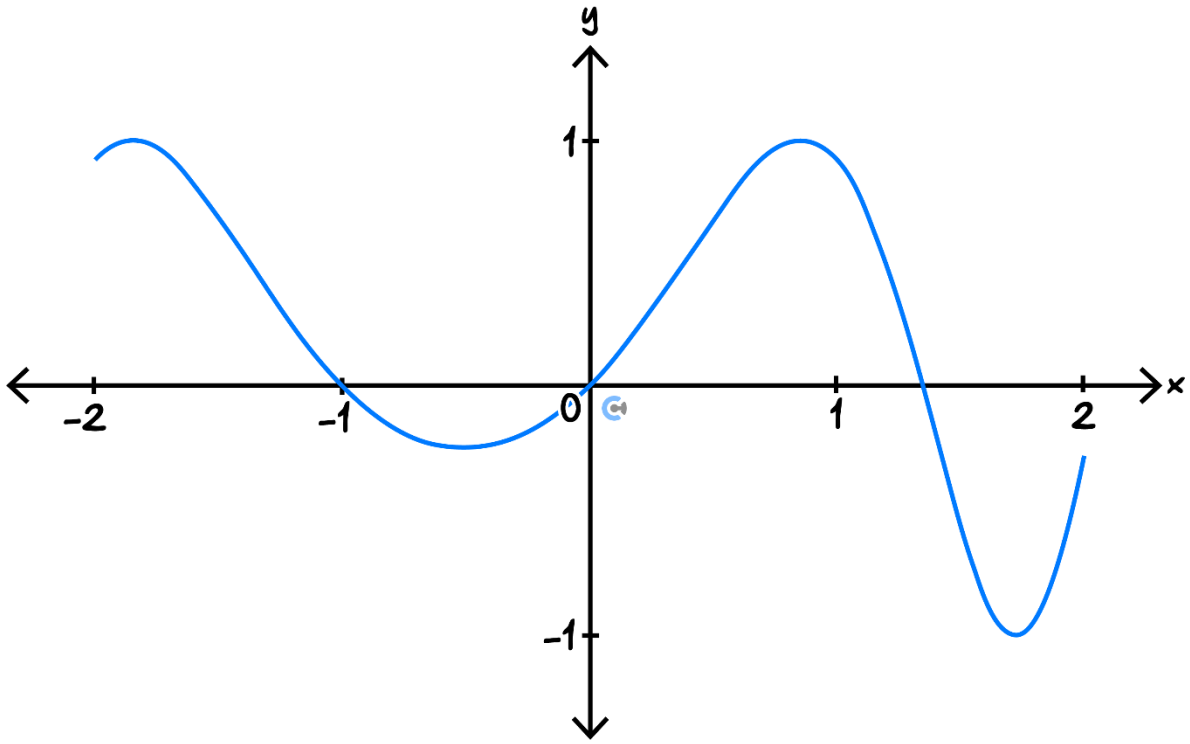
Question 20

Sketch the graph of the function $y = f(|x|)$ where $f(x) = (x-1)^2$. Label any axis intercepts.



Question 21

Sketch the graphs of the functions $y = f(|x|)$ and $y = f(-|x|)$ in the interval $-2 < x < 2$ where the graph of $y = f(x)$ is shown below.



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Sub-Section: Apply Partial Fractions to Find a Decomposed Form

Question 22

Perform partial fraction decomposition to write the following functions in the form specified below.

a. $\frac{6x+2}{(x-3)(x+1)} = \frac{A}{x-3} + \frac{B}{x+1}$

b. $\frac{5x^2-24x+29}{(x-3)^2(x-2)} = \frac{A}{x-3} + \frac{B}{(x-3)^2} + \frac{C}{x-2}$

c. $\frac{7x^2-3x+14}{(x-1)(x^2+3x+5)} = \frac{A}{x-1} + \frac{Bx+C}{x^2+3x+5}$

Question 23

Perform partial fraction decomposition to the following functions.

a. $\frac{8x-12}{x^2-2x-3}$

b. $\frac{7x^2+6x-8}{x^3+2x^2}$

c. $\frac{6x^3-x-6}{x^4-2x^3}$

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Question 24

Perform partial fraction decomposition to the following functions.

a. $\frac{x^3-4x^2+18}{x^2+x-2}$

b. $\frac{x^4+x^3-x^2-x-3}{x^2-x-2}$

c. $\frac{7x^4+10x^3+24x^2-38x-35}{(x-1)(x^2+2x+5)}$

Question 25

Perform partial fraction decomposition to the function $f(x) = \frac{x^6+4x^5-x^4+x^3-27x^2-9x+22}{(x-2)(x^2+x+4)}$.

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