

Curve Sketching: some discussion questions

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LAST UPDATED APRIL 3, 2020.

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3.1 Practice on basic techniques

Sketch the following curves, showing clearly the asymptotes and the coordinates of points of intersection with the axes as well as any stationary points (if applicable)

1. $y = \frac{5}{x+3}$.

2. $y = \frac{2}{3-2x}$.

3. $y = \frac{2x+1}{x-1}$.

4. $y = \frac{x}{3x-1}$.

5. $y = \frac{2x^2+3x+1}{x}$.

6. $y = \frac{x^2+3x+1}{x+2}$.

3.2 Questions with some "tricks"

Sketch the following curves, showing clearly the asymptotes and the coordinates of points of intersection with the axes as well as any stationary points (if applicable)

7. $y = \frac{2x^2-x+2}{2x-4}$.

8. $y = \frac{2x^2+4x-1}{x-1}$.

9. $y = \frac{3(1-x)}{(3x-2)(x+2)}$.

10. $y = \frac{x^2-18x+81}{x^2-9}$.

3.3 Some more advanced follow up questions

11. (Follow up on question 9)
How many roots does the equation

$$\frac{3(1-x)}{(3x-2)(x+2)} = -3x-1$$

have?

12. (Follow up on question 10)
Find the range of values of k such that the equation

$$\frac{x^2 - 18x + 81}{x^2 - 9} = k$$

has two real and distinct solutions.

13. (Follow up on question 5)
Find the set of values k can take such that the equation

$$\frac{2x^2 + 3x + 1}{x} = kx + 3$$

has no solutions.