

Two-way calculus – teacher notes

Student work

Group A


(line of symmetry at $x = 1$)


	y-axis is an asymptote	<i>Different values of x can have the same value of y.</i>	<i>y intercept = $+3$</i>	passes through origin
$x = 1$ is a root		$y = x - 1 $	$y = -3x + 3$	
has exactly two roots		$y = x(x - 2)$		
<i>function is not defined for all values of x</i>	$y = \frac{1}{x}$ for $x \neq 0$	$y = \frac{1}{(x - 1)^2}$ for $x \neq 1$	$y = \frac{3}{x + 1}$ for $x \neq -1$	
$y \rightarrow \infty$ as $x \rightarrow \infty$	$y = x + \frac{1}{x}$	$y = (x - 1)^2$	$y = 2 + (x - 1)^4$	

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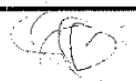
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Group B



	y-axis is an asymptote	linear	y intercept is 3	passes through origin
x = 1 is a root	$y = x + \frac{1}{x}$	$y = x - 1 $	$y = -3x + 3$	$y = x(x - 1)$
has exactly two roots	$y = x - \frac{1}{x}$	$y = x(x - 2)$	$y = -x^2 + 3$	$y = x(x - 2)$
Not defined for all x values	$y = \frac{1}{x}$ for $x \neq 0$	$y = \frac{1}{(x - 1)^2}$ for $x \neq 1$	$y = \frac{3}{x + 1}$ for $x \neq -1$	$y = \frac{1}{x - 3} + \frac{1}{3}$ $x \neq 3$
$y \rightarrow \infty$ as $x \rightarrow \infty$	$y = x - \frac{1}{x}$	$y = x $	$y = 2 + (x - 1)^4$	$y = x(x - 1)$

Group C

	y-axis is an asymptote			passes through origin
x = 1 is a root	$y = \frac{1}{ x } - 1$	$y = x - 1$ $x(x-1)$	$y = +3x + 3$	$x(x-1)$
has exactly two roots	$y = \frac{1}{ x } - 1$	$y = x(x-2)$ $(x-1)^2 + 2$	$(x^2-1)^2 + 2$	$x(x-1)$
$\exists x: f(x)$ undefined	$y = \frac{1}{x}$ for $x \neq 0$	$y = \frac{1}{(x-1)^2}$ for $x \neq 1$	$y = \frac{3}{x+1}$ for $x \neq -1$	
$y \rightarrow \infty$ as $x \rightarrow \infty$			$y = 3x - 3$ $y = 2 + (x-1)^4$	$x(x-1)$

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Group D

	y-axis is an asymptote	Has n roots < 0		passes through origin
$x = 1$ is a root	$y = \frac{1}{x} - 1$	$y = x - 1 $	$y = -3x + 3$	$x^2 + y^2 = \frac{1}{4}$ $(x - \frac{1}{2})^2 + y^2 = \frac{1}{4}$
has exactly two roots	$y = \frac{1}{ x } - 1$	$y = x(x - 2)$		$y = (x + 1)^2$ $y + 1 = (x + 1)^2$
Has a vertical asymptote	$y = \frac{1}{x}$ for $x \neq 0$	$y = \frac{1}{(x - 1)^2}$ for $x \neq 1$	$y = \frac{3}{x + 1}$ for $x \neq -1$	$y = \frac{1}{x + 1} - 1$
$y \rightarrow \infty$ as $x \rightarrow \infty$			$y = 2 + (x - 1)^4$	$y = x$

Group E

	y-axis is an asymptote	positive roots $x = a$ to ∞ symmetrical abt $x = 1$	Has real roots. y intercept at (0,3)	passes through origin
$x = 1$ is a root	$\ln(x) = y$	$y = x - 1 $	$y = -3x + 3$	$x(x-1)^2 = y$
has exactly two roots	$y = \frac{1}{ x } - 1$	$y = x(x - 2)$	$y = x^2 + 4x + 3$	$y = x(x+1)^2$
undefined for all values of x ,	$y = \frac{1}{x}$ for $x \neq 0$	$y = \frac{1}{(x-1)^2}$ for $x \neq 1$	$y = \frac{3}{x+1}$ for $x \neq -1$	
$y \rightarrow \infty$ as $x \rightarrow \infty$			$y = 2 + (x-1)^4$	$y = e^x - 1$