

شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية



شرح الدرس الثالث Graphing reciprocal functiobs من الوحدة السابعة ريفيل

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التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



روابط مواد الصف الحادي عشر المتقدم على تلغرام

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المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة رياضيات في الفصل الأول

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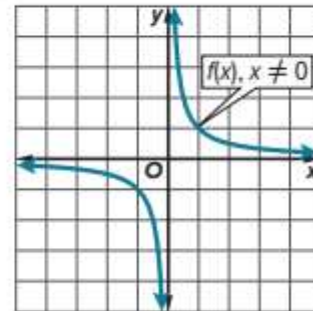


Learn Graphing Reciprocal Functions

A **reciprocal function** has an equation of the form $f(x) = \frac{n}{b(x)}$, where n is a real number and $b(x)$ is a linear expression that cannot equal 0.

Key Concept • Reciprocal Functions

Parent function	$f(x) = \frac{1}{x}$
Type of graph	hyperbola
Domain and range	all nonzero real numbers
Asymptotes	$x = 0$ and $f(x) = 0$
Intercepts	none
Not defined	$x = 0$



Note: Excluded values of x are the values that make the denominator=0

Ex1: Determine the excluded value of x for each function.

4. $g(x) = \frac{5}{-6x}$

deno = 0
 $\frac{-6x}{-6} = \frac{0}{-6}$
 $x = 0$

5. $f(x) = \frac{5}{2x+3}$

deno = 0
 $2x+3 = 0$
 $\frac{2x}{2} = \frac{-3}{2}$
 $x = -3/2$

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$f(x) = \frac{6}{x^2 + 4x - 12}$

$x^2 + 4x - 12 = 0$

$x_1 = 2$ $x_2 = -6$

For any Reciprocal function $f(x) = \frac{a}{bx+c} + d$

- 1) Vertical asymptote is where the function **undefined** (Zeros of denominator)
- 2) Horizontal asymptote is **end behavior of $f(x)$** ($y = d$)
- 3) To find y-intercept → substitute $x=0$ and find $f(0)$
- 4) To find x-intercept → substitute $f(x)=0$ and solve for x

Ex2: Identify the asymptotes, domain, and range of each function, identify its intercepts Then graph the function

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

① Vertical asymptote \Rightarrow deno = 0 \Rightarrow $x=0$ y-axis

② Hor asymptote \Rightarrow $y=-3$

③ y-intercept \Rightarrow $x=0 \Rightarrow f(0) = \frac{2}{0} - 3$ undefined
No y-int

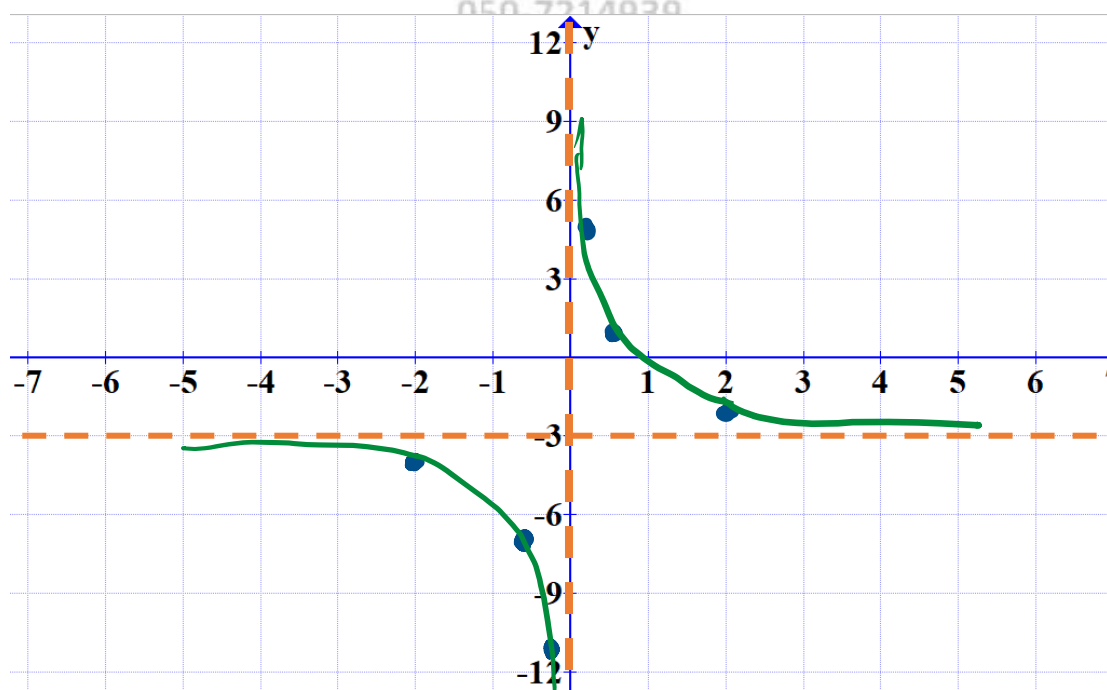
④ X-int \Rightarrow $f(x)=0 \Rightarrow 0 = \frac{2}{x} - 3$

$$3 \cancel{\times} \frac{2}{x} \Rightarrow \frac{3x}{3} = \frac{2}{3}$$

$$x = \frac{2}{3}$$

⑤ Graph

x	-2	-0.5	-0.25	0	0.25	0.5	2
y	-4	-7	-11		5	1	-2



⑥ Domain : $(-\infty, 0) \cup (0, \infty)$ OR $\{x \mid x < 0 \text{ or } x > 0\}$

⑦ Range : $(-\infty, -3) \cup (-3, \infty)$ OR $\{f(x) \mid f(x) < -3 \text{ or } f(x) > -3\}$

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

1) Vertical asy \Rightarrow den = 0 $\Rightarrow x+2=0 \Rightarrow \boxed{x=-2}$

2) Hor asy $\Rightarrow \boxed{y=0}$ x-axis

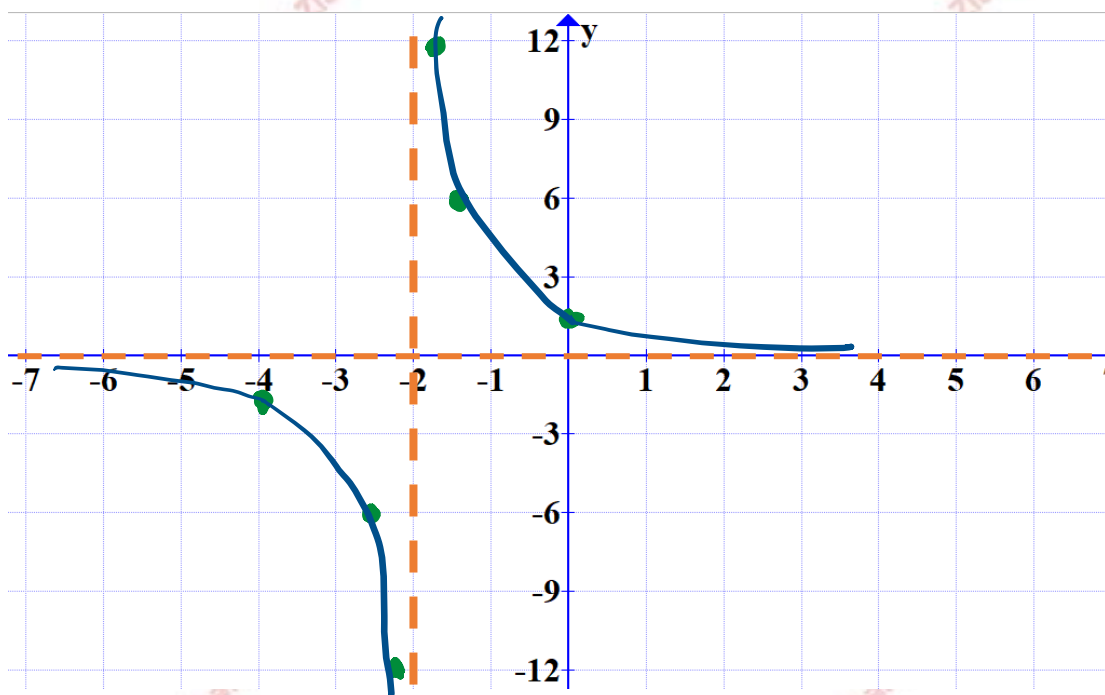
3) y-int $\Rightarrow x=0 \Rightarrow f(0) = \frac{3}{0+2} = 1.5$

4) x-int $\Rightarrow f(x) = 0 \Rightarrow \frac{3}{x+2} \neq \frac{0}{1} \Rightarrow 0 = 3$ No solution
No x-int

5) Graph

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x	-4	-2.5	-2.25	-2	-1.75	-1.5	0
f(x)	-1.5	-6	-12	///	12	6	1.5



6) Domain : $(-\infty, -2) \cup (-2, \infty)$ OR $\{x \mid x < -2 \text{ or } x > -2\}$
OR $\{x \mid x \neq -2\}$

7) Range : $(-\infty, 0) \cup (0, \infty)$ OR $\{f(x) \mid f(x) < 0 \text{ or } f(x) > 0\}$
OR $\{f(x) \mid f(x) \neq 0\}$

Key Concept • Transformations of Reciprocal Functions

$$g(x) = \frac{a}{x-h} + k$$

h – horizontal translation

If $h > 0$, the graph of $f(x)$ is translated h units right.
If $h < 0$, the graph of $f(x)$ is translated $|h|$ units left.
The *vertical asymptote* is at $x = h$.

k – vertical translation

If $k > 0$, the graph of $f(x)$ is translated k units up.
If $k < 0$, the graph of $f(x)$ is translated $|k|$ units down.
The *horizontal asymptote* is at $f(x) = k$.

a – orientation and shape

If $|a| > 1$, the graph is stretched vertically.
If $0 < |a| < 1$, the graph is compressed vertically.

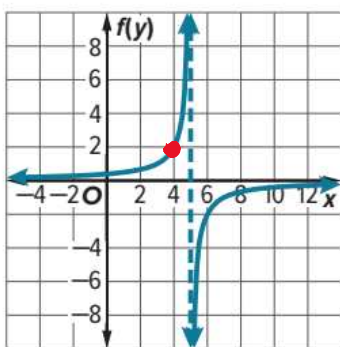
Ex3: State the transformations applied on the parent reciprocal function

$$f(x) = \frac{-4}{x+3} - 5 \quad \text{parent } g(x) = \frac{1}{x}$$

- ① Translation 3 units left
- ② Vertical stretch by factor 4
- ③ Reflection across x -axis
- ④ Translation 5 units down

Ex4: Identify the values of a , h , and k . Then write a function for the graph $g(x) = \frac{a}{x-h} + k$.

17.



Vertical asy $x=5$
 $\Rightarrow h=5$

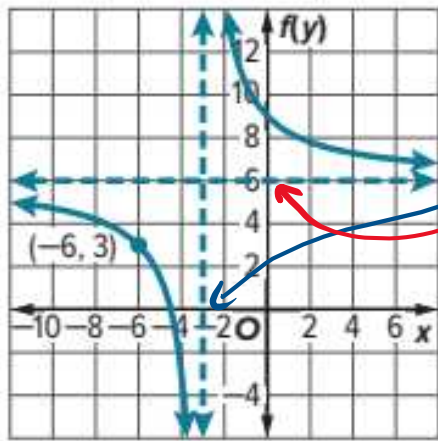
Hor asy $y=0$
 $\Rightarrow k=0$

To find a choose a point on the curve
of $g(x)$ for example $(4, 2)$

$$g(x) = \frac{a}{x-h} + k$$

$$2 = \frac{a}{4-5} + 0 \Rightarrow \frac{-a}{-1} = \frac{2}{-1} \Rightarrow a = -2$$

Identify the values of a , h , and k . Then write a function for the graph $g(x) = \frac{a}{x-h} + k$.



$$h = -3$$

$$k = 6$$

$$g(x) = \frac{a}{x-h} + k \quad (-6, 3)$$

$$3 = \frac{a}{-6 - (-3)} + 6$$

$$3 = \frac{a}{-3} + 6 \Rightarrow \frac{a}{-3} = -3$$

$$a = 9$$

Q12) P.333 To manufacture a specific model of computer, a company pays \$5000 for rent and overhead and \$435 per computer for parts.

a. Write the function relating the **average cost** to make a computer **C** to how **many computers n** are being made.

$$\text{Total cost for producing } n \text{ computers} = (435 \cdot n) + 5000$$

$$\text{Average Cost for each pc} = \frac{\text{total cost}}{\text{no. of pc's}} = \frac{435n + 5000}{n}$$

$$= \frac{435n}{n} + \frac{5000}{n}$$

$$\Rightarrow C = \frac{5000}{n} + 435$$

b. Find the domain

$$\text{Zeros of deno} \Rightarrow n = 0$$

no of computers must be positive

$$\Rightarrow \text{Domain} = \{n \mid n > 0, n \text{ integer}\}$$