

Midterm from last fall?

Homework :

context.

I'm NOT looking for answers copied
from the book. Homework's a learning
tool. Use it!

S3.4

<http://www.harryzaims.com/121-all/121-fall-13/>

The most recent/relevant tests:

<http://www.harryzaims.com/121-all/121-fall-11/practice-tests/1202-fall-12/>

7. Write an equation in point-slope form of the line through $P(3, -7)$ that is parallel to the line $y = \frac{2}{7}x + \frac{11}{97}$

$$y = m(x - x_1) + y_1$$

$$y = \frac{2}{7}(x - 3) - 7$$

New $y = \underbrace{\text{slope} * \text{change in } x}_{\text{change in } y} + \text{old } y\text{-value}$

$$y = f(x) = x$$

$$y = \frac{2}{7}f(x - 3) - 7$$

$$\frac{2}{7}(x - 3) - 7$$

View ALL lines as transformations on $y = x$.

9. Let $f(x) = \frac{x+5}{x-7}$ and $g(x) = \sqrt{x+3}$.

a. What is the domain of f ?

$$\mathcal{D}(f) = \{x \mid x \neq 7\} = (-\infty, 7) \cup (7, \infty)$$

$$\mathcal{D}(g) = \{x \mid x+3 \geq 0\} = \{x \mid x \geq -3\} = [-3, \infty)$$

$$(f \circ g)(x) = \frac{\sqrt{x+3} + 5}{\sqrt{x+3} - 7} = f(g(x))$$

$$\mathcal{D}(f \circ g) = \{x \mid x \in \mathcal{D}(g) \text{ and } g(x) \in \mathcal{D}(f)\}$$

$$= \{x \mid x \geq -3 \text{ and } \sqrt{x+3} \neq 7\}$$

$$= \boxed{\{x \mid x \geq -3 \text{ and } x \neq 46\} = [-3, 46) \cup (46, \infty)}$$

Set-builder Interval

Scratch

A number line starting at -3 with a blue square bracket '[' and an arrow pointing to the right. The label 'x ≥ -3' is written to the right of the arrow.

A number line starting at -3 with a blue square bracket '[' and an arrow pointing to the right. At 46, there is a blue parenthesis ')' and a blue parenthesis '(' with an arrow pointing to the right. The label 'x ≠ 46' is written to the right of the arrow.

A number line starting at -3 with a red square bracket '[' and an arrow pointing to the right. At 46, there is a red parenthesis ')' and a red parenthesis '(' with an arrow pointing to the right. The label 'x ≥ -3 and x ≠ 46' is written to the right of the arrow, with 'and' underlined.

Keli!

$$\begin{aligned} \sqrt{x+3} &\neq 7 \\ x+3 &\neq 49 \Rightarrow x \neq 46 \end{aligned}$$

5. Write the quadratic function $f(x) = x^2 - 10x + 21$ in the form $y = a(x-h)^2 + k$ and sketch its graph. Your graph should be "true to the essence of the parabola" and include the following points, clearly labeled as ordered pairs on the graph (and this is the last time I'm telling you how to label key points).

- i. Vertex
- ii. Any x- and y-intercepts

$$x^2 - 10x + 21$$

$$= x^2 - 10x + 5^2 - 25 + 21$$

$$= (x-5)^2 - 4 = f(x)$$

y-int: (0, 21)

(h, k) = (5, -4)

Follow up:
 $x^2 - 10x + 21 > 0$

 $(-\infty, 3) \cup (7, \infty)$

SET = 0 →

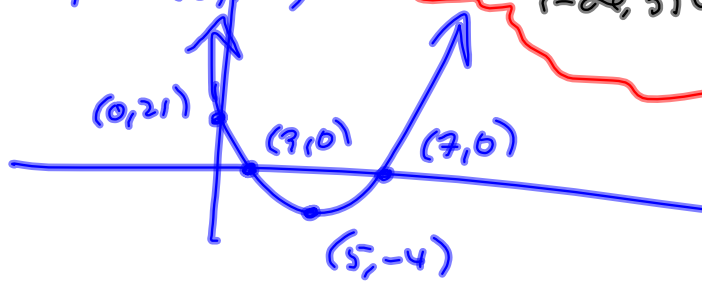
$$(x-5)^2 - 4 = 0$$

$$(x-5)^2 = 4$$

$$x-5 = \pm 2$$

$$x = 5 \pm 2$$

→ 7 → (7, 0)
 → 3 → (3, 0)



M2

$$x^2 - 10x + 21$$

$$a=1, b=-10, c=21$$

$$-\frac{b}{2a} = h = \frac{-(-10)}{2(1)} = 5 = h$$

$$k = f(h) = f\left(-\frac{b}{2a}\right) = f(5)$$

$$= 5^2 - 10(5) + 21$$

$$= 25 - 50 + 21$$

$$= 46 - 50 = -4 = k$$

$(h, k) = (5, -4)$

$$\downarrow$$

$$a(x-h)^2 + k$$

$$= 1(x-5)^2 - 4$$

M2a

$$(x-7)(x-3) = 0$$

$$x = 3, 7$$

M2b

$$b^2 - 4ac = (-10)^2 - 4(1)(21)$$

$$= 100 - 84 = 16$$

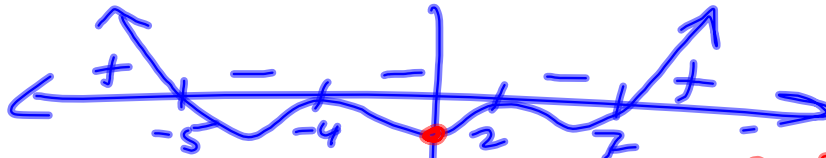
$$x = \frac{10 \pm \sqrt{16}}{2(1)}$$

$$= \frac{10 \pm 4}{2} = \frac{5 \pm 2}{1}$$

Solve $x^2 - 10x + 21 > 0$
by using the zeros
& a number line.

Sketch

$$(x-2)^2(x+5)(x-7)^{17}(x+4)^{32}$$



$$(0, (-2)^2(5)(-7)^{17}(4)^{32})$$

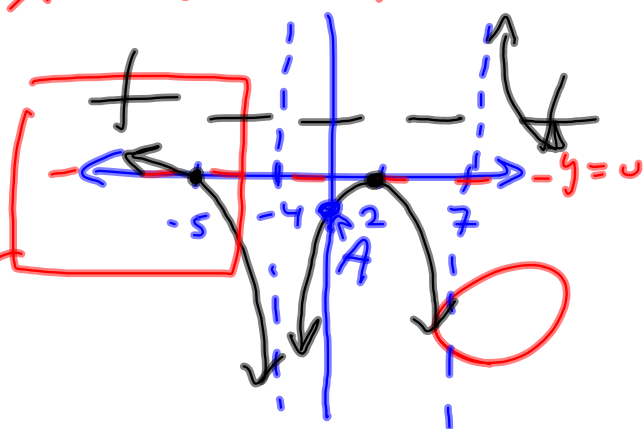
$\frac{x^3}{x^4}$ **PROPER**

$$\frac{(x-2)^2(x+5)}{(x-7)^{17}(x+4)^{32}}$$

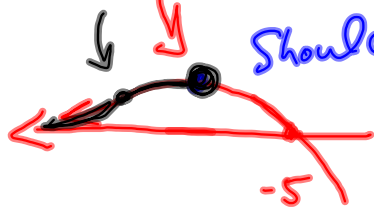
$$A = (0, \frac{(-2)^2(5)}{(-7)^{17}(4)^{32}})$$

H.A.: $y=0$

+++ ... - - - - - +



Should show the function approaching $y=0$ on the left.



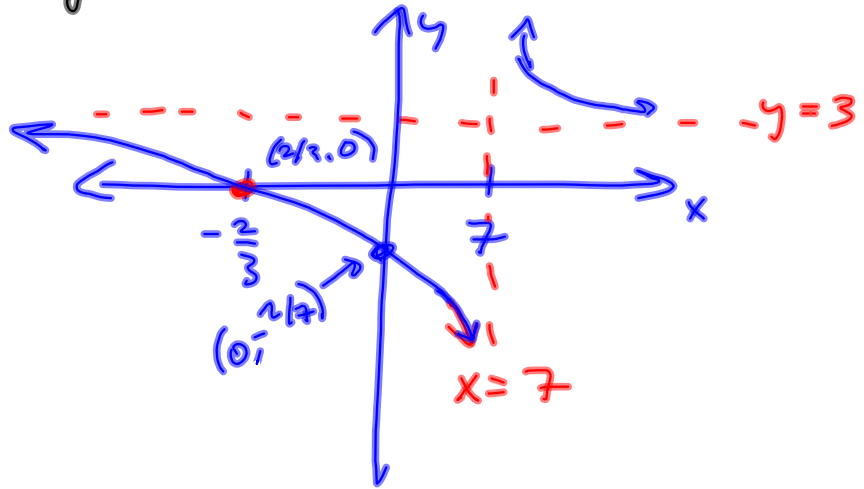
Yes, you can cross a horizontal asymptote. But $|x| \rightarrow \text{big}$ & you're close to, but not touching the H.A.

Linear
Linear in class

Find Oblique asymptote in class

$$y = \frac{3(x + \frac{2}{3})}{(x-7)}$$

H.A.: $y=3$



Find oblique asymptote

$$f(x) = \frac{5x^4 - 3x^2 + 7x - 2}{x^3 - 7}$$

$$\frac{5x^4}{x^3} = 5x$$

$5x \rightarrow y = 5x$ is O.A.

$$\begin{array}{r} x^3 - 7 \overline{) 5x^4 + 0x^3 - 3x^2 + 7x - 2} \\ \underline{-(5x^4)} \\ -3x^2 + 42x - 2 \end{array}$$

Remark

$$\frac{5x^4 - 3x^2 + 7x - 2}{x^3 - 7} = 5x + \frac{-3x^2 + 42x - 2}{x^3 - 7}$$

$\frac{29}{3} = 9 + \frac{2}{3}$