

Precalculus Unit 3

Test Review

In exercises 1-2, simplify each rational expression.

1) $\frac{x^2 + 6x + 5}{x^2 + 3x - 10}$

$\frac{x+1}{x-2}$

2) $\frac{6x^2 - 7x - 3}{8x^2 - 2x - 15}$

$\frac{3x+1}{4x+5}$

In exercises 3-6, perform each of the following operations. Write your answer in simplest form. State any restrictions.

3) $\frac{x^2 + 16x + 55}{x^2 - 8x - 65} \cdot \frac{x^3 - 11x^2 - 26x}{x^2 + 13x + 22}$

$\frac{x}{x \neq 13, x \neq -5, x \neq -2}$

4) $\frac{5x^2}{2x^2 + 5x - 33} \div \frac{5x^3 - 20x}{2x^2 + 15x + 22}$

$\frac{x}{(x-3)(x-2)}$
 $x \neq -\frac{1}{2}, x \neq 3, x \neq -2, x \neq 2$

5) $\frac{x}{x^2 - 1} - \frac{5}{3x^2 - 7x - 10} : \frac{3x^2 - 15x + 5}{(x+1)(x-1)(3x-10)}$

$x \neq \frac{1}{3}, x \neq 1, x \neq -1$

6) $\frac{\frac{5}{x-2}}{\frac{1}{x-2} + \frac{2}{x+1}} : \frac{5(x+1)}{3(x-1)}$

$x \neq 2, x \neq -1, x \neq 1$

7) Determine the holes, intercepts, asymptotes, and then sketch each of the following. Write limit statements

a) $f(x) = \frac{x^2 - 4}{x^2 - 9}$

b) $f(x) = \frac{3x^2 - x - 4}{9x^3 + 9x^2 - 16x - 16}$

Hole(s):

Hole(s): $(\frac{4}{3}, \frac{1}{8})$ $(-1, 1)$

x-int: $(2, 0)$ $(-2, 0)$

x-int:

y-int: $(0, \frac{4}{9})$

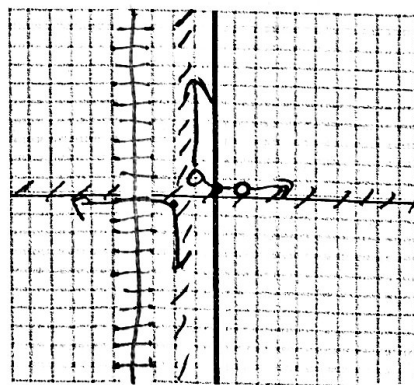
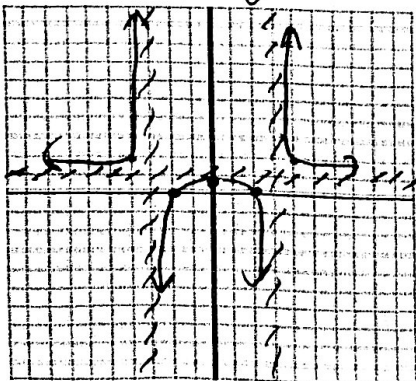
y-int: $(0, \frac{1}{4})$

Eqns of ALL Asymptotes:

$x=3$ $x=-3$ $y=1$

Eqns of ALL Asymptotes:

$x=-\frac{4}{3}$ $y=0$



8) Use the graph to the right to fill in the blanks:

$$\lim_{x \rightarrow -\infty} = \underline{1}$$

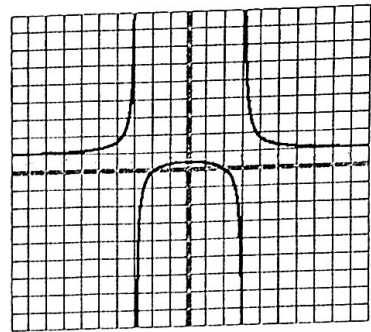
$$\lim_{x \rightarrow -3^-} = \underline{\infty}$$

$$\lim_{x \rightarrow -3^+} = \underline{-\infty}$$

$$\lim_{x \rightarrow 3^-} = \underline{-\infty}$$

$$\lim_{x \rightarrow 3^+} = \underline{\infty}$$

$$\lim_{x \rightarrow \infty} = \underline{1}$$



In exercises 9-10, solve each rational equation. Be sure to check for extraneous solutions.

9) $\frac{x-2}{x+4} + \frac{x+1}{x+6} = \frac{11x+32}{x^2+10x+24}$ $x=5$

10) $\frac{3x}{x+5} + \frac{1}{x-2} = \frac{7}{x^2+3x-10}$ $x = -\frac{1}{3}$

In exercises 11-13, solve each inequality.

11) $2x^2 - 2x - 12 > 0$ $(-\infty, -2) \cup (3, \infty)$

12) $x^3 + 9x^2 + 20x + 12 < 0$ $(-\infty, -6) \cup (-2, -1)$

13) $\frac{x^2-4}{x^2+4} \geq 0$ $(-\infty, -2] \cup [2, \infty)$

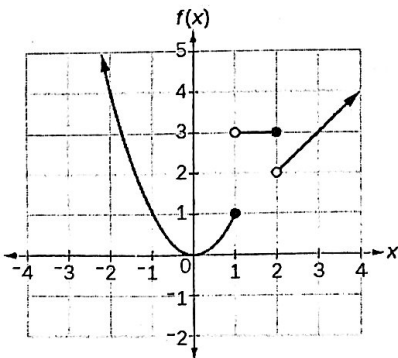
14) $\frac{(x-1)^2}{(x+1)(x+2)} > 0$ $(-\infty, -2) \cup (-1, 1) \cup (1, \infty)$

15) $\frac{3+x}{3-x} \geq 1$ $[0, 3)$

16) $\frac{6}{x+3} > x+8$ $(-\infty, -9) \cup (-3, -2)$

REVIEW FROM PREVIOUS UNITS

17) Determine the domain & range and write an equation for the piecewise function.



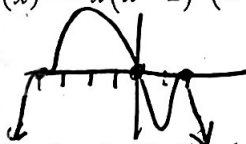
$$D: (-\infty, \infty)$$

$$R: [0, \infty)$$

$$f(x) = \begin{cases} x^2, & x \leq 1 \\ 3, & 1 < x \leq 2 \\ x, & x > 2 \end{cases}$$

18) Solve: $2x^3 + 9x^2 + 19x + 15 = 0$

19) Sketch a graph of the polynomial $f(x) = -x(x-2)^4(x+4)^5$. Describe its end behavior, and boundedness.



$\lim_{x \rightarrow -\infty} f(x) = -\infty$

Bounded Above

$\lim_{x \rightarrow \infty} f(x) = -\infty$

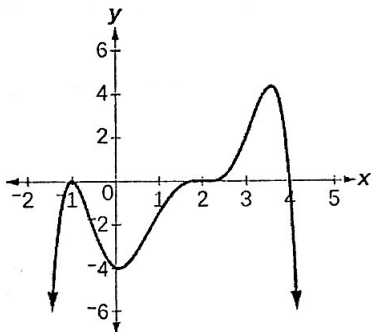
20) Write an equation of the line if $f(2) = 6$ and $f(-4) = 1$.

(a) $y - 6 = \frac{5}{6}(x - 2)$ (b) $y - 1 = \frac{5}{6}(x + 4)$ (c) $y = \frac{5}{6}x + \frac{13}{3}$

21) Write an equation of the quadratic in vertex form if the vertex is $(-1, 4)$ and it passes through $(3, -2)$.

$y = -\frac{3}{8}(x + 1)^2 + 4$

22) Write a possible linear factorization of the graph below:



$f(x) = -(x + 1)^2(x - 2)^3(x - 4)$

23) Describe the graph of $y = 4x^{\frac{2}{3}}$. Determine if it is even, odd, or neither.

$4\sqrt[3]{x^2}$ Even

24) Determine which statements are true or false for the cubic function $f(x) = (2x - 1)(x^2 + 6x + 13)$:

A) $2x - 1$ is a linear factor of $f(x)$ **T**

B) $x - (-3 - 2i)$ is a factor of $f(x)$ **T**

C) $-3 + 2i$ is a zero of $f(x)$ **T**

D) the graph of $f(x)$ will cross the x-axis 3 times **F**

E) there are 2 non-real roots and 1 real root for $f(x)$ **T**

25) Determine the two functions that implicitly define the relation $9x^2 - 24xy + 16y^2 = 100$

$y = \frac{3}{4}x + \frac{5}{2}$

$y = \frac{3}{4}x - \frac{5}{2}$