Material covered on Thursday's benchmark:

- Ch 13 (Sections 1, 2, 3, 5): Rational Expressions and Equations
- Section 13.4: Rational Functions
- Exponential Functions & Previous Function Knowledge

1) Joanna's pay for working overtime, p, varies jointly as the number of hours she works, n, and her hourly pay rate, r, and $p=\$103.44$ when $n=8$ hours and $r=\$8.62$. Find n when $p=\$213.75$ and $r=\$9.50$.

2) The cost of packing boxes, c, varies inversely with the number of boxes, b, purchased. If $c=\$0.75$ when $b=20$, determine the cost of packing 5 boxes.

3) The time required to process a shipment of goods at Wal-Mart varies directly with the number of items in the shipment and inversely with the number of workers assigned. If 15,000 items can be processed by 8 workers in 10 hours, then how long would it take 12 workers to process 20,000 items?

Simplify the following rational expressions.

4) $\dfrac{x+1}{x^2-7x-18} \div \dfrac{7x^2}{7x^3+14x^2}$

5) $\dfrac{3x^2+18x}{x^2+x-30}$

6) $\dfrac{x^2+6x+5}{6x+6} \cdot \dfrac{x-6}{5x^2+25x} \cdot \dfrac{15x-30}{3}$

7) $\dfrac{x}{x+3} + \dfrac{2x+6}{x^2+6x+9}$

8) $\dfrac{2x^2+64}{x^2-64} - \dfrac{x-4}{x+8}$

9) $\dfrac{2}{y+3} - \dfrac{y}{y-1} + \dfrac{y^2+2}{y^2+2y-3}$

10) $\dfrac{\dfrac{x}{x+2}}{2x+\dfrac{x}{5}}$

11) $\dfrac{\dfrac{x^2+8x+15}{x^2+x-6}}{\dfrac{x^2+2x-15}{x^2-2x-3}}$

12) $\dfrac{20x^4}{x^2y} \cdot \dfrac{x^3}{6y^3} \div \dfrac{10x^2y}{12y^6}$

13) $\dfrac{x^2+13x+42}{x^3-2x^2-63x}$

14) $\dfrac{\dfrac{1}{2}+\dfrac{1}{x}}{\dfrac{1}{4}-\dfrac{1}{x^2}}$

15) $\dfrac{x}{6x+24} - \dfrac{4}{x^2+2x-8}$

Solve and check for extraneous solutions.

16) $x - \dfrac{6}{x} = 5$

17) $\dfrac{2}{d+2} + \dfrac{8}{d-2} = \dfrac{14}{d^2-4}$

18) $\dfrac{4}{x^2-4} = \dfrac{1}{x-2}$

Find the characteristics listed of the rational function. List the transformations.

19) $f(x) = -\frac{2}{x+5} - 1$

Vertical Asymptote: _____

Horizontal Asymptote: _____

Domain: _____

Range: _____

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

Vertical Asymptote: _____

Horizontal Asymptote: _____

Domain: _____

Range: _____

21) Write a rational function with a hole located at $x = -3$, vertical asymptotes at $x = 4$, zero of $x = \frac{2}{3}$, and horizontal asymptote of $y = 3$.

22) Write a rational function with a hole located at $x = 0$, vertical asymptotes at $x = -9 \; and \; \frac{1}{6}$ and horizontal asymptote of $y = 0$.

Find the characteristics of each rational function.

23) $f(x) = \frac{2x^2 - 5x - 3}{x^2 + 4x - 21}$

24) $f(x) = \frac{x^2 + 6x + 5}{x - 2}$

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

VA

HA

SA

Zeros

Holes

VA

HA

SA

Zeros

Holes

VA

HA

SA

Zeros

Holes

Write Question #24 in the translated form of $f(x) = \frac{a}{x-h} + k$ and List All Transformations.

Given the following exponential functions. Give the domain/range (interval notation), the asymptote equation, end behavior (using limits), the parent function, growth/decay, and transformations.

26) $f(x) = 2 \cdot 4^{x-7} - 6$

27) $g(x) = -\left(\frac{1}{2}\right)^{3x+5}$

28) $f(x) = \frac{5}{4} \cdot \left(\frac{3}{4}\right)^{-\frac{5}{6}x} + 3$

29) $g(x) = -5^x - 8$

For the following functions, give domain/range, equations of any asymptotes, and end behavior (using limits)

30) $f(x) = -x^7 + 6x^2 - 3$

31) $g(x) = -\sqrt{x-3} + 4$

32) $f(x) = -4|3x| + 4$

33) $g(x) = \frac{3}{x} + 5$