166 chapter 4 review and practice exam. Practice for Thursday's problems:

1. For the equation: $y = x^{2/5}(x-3)$ on the interval [-2,4]

- Find the roots and vertical asymptotes if any
- Find the critical numbers (where the first derivative might change signs)
- Find the values where the second derivative might change signs
- Make a table showing where the first and second derivative are positive and negative
- Sketch the general shape of the graph
- Find y-coordinates and label the local minima, local maxima and points of inflection
- Sketch the graph of the function that includes/reflects the information you found above.
- Find and tell the absolute maximum and absolute minimum on the interval

2. For the equation $y = \dfrac{x}{(x+3)^2}$

- Find the roots and vertical asymptotes if any
- Find and prove the horizontal asymptote by using/finding an infinite limit
- Find the critical numbers (where the first derivative might change signs)
- Find the values where the second derivative might change signs
- Make a table showing where the first and second derivative are positive and negative
- Sketch the general shape of the graph
- Find y-coordinates and label the local minima, local maxima and points of inflection
- Sketch the graph of the function that includes/reflects the information you found above.

Other typical, likely rational functions are:

$y = \dfrac{x}{x^2+3}$ $\quad y = \dfrac{x+3}{x-2}$ $\quad y = \dfrac{3}{x^2+4}$

3. Find the infinite limits

- $\lim\limits_{x\to\infty} \dfrac{\sqrt{4+9x^2}}{2x+5}$
- $\lim\limits_{x\to-\infty} \dfrac{2x+5}{\sqrt{4+9x^2}}$
- $\lim\limits_{x\to\infty} \sqrt{4x^2+5x} - 2x$

4. Sketch a graph that satisfies:

$\lim\limits_{x\to 2^-} f(x) = 3 \qquad \lim\limits_{x\to 2^+} f(x) = -1$

$f'(x) > 0$ for $x < -3, 0 < x < 2$

$f'(x) < 0$ for $-3 < x < 0$

$f'(x) = 0$ for $x = -3$, $x = 0$, $x > 2$

$f''(x) < 0$ for $x < -1.5$

$f''(x) > 0$ for $-1.5 < x < 2$

5. Sketch a continuous graph that satisfies:

$f(0) = 1$

$f'(0)$ is undefined $\qquad f'(2) = 0$

$f'(x) < 0$ for $0<x<2$

$f'(x) > 0$ for $x<0$, $x>2$

$f''(x) < 0$ for $x>3$

$f''(x) > 0$ for $x<0$, $0 < x < 3$

$\lim\limits_{x\to\infty} f(x) = -1 \qquad \lim\limits_{x\to-\infty} f(x) = 0$