Final Review Solutions

College Algebra

1. T
2. T
3. F
4. $p(x-1) = (x-1)^2 + x - 1$.

   So, $p(x-1) = 0$ when
   $$(x-1)^2 + x - 1 = 0$$
   By the definition of exponents and distribution we have,
   $$x^2 - 2x + 1 + x - 1 = 0$$
   Thus,
   $$x^2 - x = 0$$
   By the zero product property,
   $$x(x-1) = 0$$
   so, $x = 0$ or $x = 1$.
5. Any real number except -1, since the denominator at $x = -1$ is zero.
6. Shiting to the right 2 implies subtracting 2 from the input:
   $$p(x-2).$$
   Down 3 implies subtracting 3 from the output:
   $$p(x) - 3.$$
   Putting the two together we have
   $$p(x-2) - 3 = (x-2)^2 + x - 2 - 3$$
   $$= (x-2)^2 + x - 5.$$

7. Vertical asymptotes occur when the input results in division by zero. Thus, the vertical asymptote is at $x = -3$
   Horizontal asymptotes are the output when x approaches ∞ or $-\infty$. Thus, the horizontal asymptote is zero, since for large positive or negative values of x the function approaches zero.

8. Multiplying the first equation by -3 we get

$$-6x - 12y = 30$$

   Thus,

$$30 + 6 = (-6x - 12y) + 6x + 3y = -9y$$

   Therefore, $y = \frac{36}{-9} = -4$.
   Plugging in $y = -4$ into the first equation we find $x = 3$.

   The only solution is $x = 3, y = -4$.

9. First we find the slope of the line by observing y increases by 4 as x increases by 1. So, our slope is 4.
   Therefore, at $x = 0$ our y value is $5 - 4 - 4 = -3$.
   Thus, the line is

$$y = 4x - 3$$

10. We find the minimum by rewriting the quadratic as a transformation of x^2.
    Note,

$$(x + 7)^2 = x^2 + 14x + 49$$

    Thus,

$$(x + 7)^2 + 10 = x^2 + 14x + 59$$

    meaning the minimum value of the function is 10.

True or False? No work necessary.

1. $\log_3 27 = 3$
2. $\dfrac{x^3}{x+1}$ is a rational function
3. $-7 = x^{90}$

State thought process and justification.

$$p(x) = x^2 + x$$
$$l(x) = x + 1$$

4. Solve $p(x-1) = 0$.
5. What's the domain of $\frac{p(x)}{l(x)}$?
6. Find the equation of $p(x)$ shifted right 2 and down 3
7. Identify the vertical and horizontal asymptotes of $\dfrac{1}{x+3}$.
8. Find all solutions to
$$2x + 4y = -10$$
$$6x + 3y = 6$$
9. Find the equation of the line going through $(2, 5)$ and $(3, 9)$.
10. Find the minimum of $x^2 + 14x + 59$.