Name: _____

Domain and Range Worksheet

Algebraically determine the following domains. Use correct set notation.

1. $f(x) = x^3 - 6x^2 + 5x - 11$
2. $g(t) = \sqrt{2 - 3t}$
3. $h(p) = \dfrac{p-1}{p^2 - 4}$
4. $d(y) = y + 3$
5. $g(k) = 2k^2 + 4k - 6$
6. $b(n) = \sqrt{2n - 8}$
7. $m(t) = \sqrt{9 - 3t}$
8. $u(x) = \dfrac{x-5}{2x+4}$
9. $a(r) = r + \dfrac{1}{r-1}$
10. $y(c) = \dfrac{2}{c^2 + 3c}$
11. $q(w) = \dfrac{w+4}{w^2 + 1}$

Challenging domain problems: these contain combinations of functions.

12. $f(x) = \dfrac{x}{\sqrt{x+3}}$

13. $t(v) = \sqrt{v^2 + 2v - 8}$
14. $n(t) = \sqrt{\dfrac{t}{1+t}}$
15. $x(y) = y^4 + 2y + \sqrt{y} + \dfrac{1}{y}$

Range practice: Use your calculator to graph and determine the ranges of the functions numbered 4-8.

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Answers:

1. $\mathbb{R}$, function is a polynomial
2. $\{t \mid t \leq 2/3\}$
3. $\{p \mid p \neq 2, -2\}$
4. **R**, since the function is a polynomial (line).
5. **R**, since the function is a polynomial (parabola).
6. $\{ n \mid n \geq 4 \}$
7. $\{ t \mid t \leq 3 \}$
8. $\{ x \mid$ **R** except $x = -2 \}$ or $\{ x \mid$ **R**\{-2}}
9. $\{ r \mid$ **R** except $r = 1 \}$ or $\{ r \mid$ **R**\{1}}
10. $\{ c \mid$ **R** except $c = 0$ or $c = -3 \}$ or $\{ c \mid$ R\{0,-3}}
11. **R**. The denominator can not be solve for zero. No value of w causes the denominator to equal zero.
12. { x | x > -3 }. In this case, the radical can not contain negatives, while the denominator can not contain zero (a zero under the radical is acceptable, but it makes the bottom zero, which is not acceptable).
13. $\{ v \mid v \leq -4$ or $v \geq 2 \}$. The expression under the radical is a quadratic: it needs to be set greater than or equal to zero. Factor it and plot the points -4 and 2 (this is where the expression = 0, which is okay). Use a sign chart to determine when the expression is greater than zero.
14. $\{ t \mid t < -1$ or $t \geq 0 \}$. Set the expression $\frac{t}{1+t} \geq 0$. Do NOT cross multiply!!!! Determine where the top = 0 (top = 0 at $t = 0$) and where bottom = 0 (bottom = 0 at $t = -1$). Use a sign chart to determine when the expression is 0 or greater. Notice that it's okay for $t = 0$ but not okay for $t = -1$. Why?
15. $\{ y \mid y > 0 \}$. For the first two terms, all y is acceptable. For the third term that has the radical, $y \geq 0$. But in the fourth term, $y \neq 0$, so we have to exclude the 0. The only set of numbers for which all four terms are defined is $y > 0$.

Ranges:

4. **R**. It's a line.
5. $\{ g(k) \mid g(k) \geq -8 \}$. It's a parabola. Find the vertex.
6. $\{ b(n) \mid b(n) \geq 0 \}$.
7. $\{ m(t) \mid m(t) \geq 0 \}$.

$\{ u(x) \mid$ **R** except $u(x) = 1/2 \}$. Graph it and you'll see the graph level off horizontally along the line $u(x) = 1/2$. This is a horizontal asymptote