College Algebra CHS

$\sqrt{x^2+a}$
↑
constant

Name Key

Domain & Range

Range could be a special case!

Date__________

Find the domain and range of the given function.

1) $Y(t) = 3t^2 - 2t + 1$

D: ℝ

R: $[2/3, \infty)$

$3(t^2 - \underline{2/3} + \underline{1/9} - \underline{1/9}) + 1$

$3(t - 1/3)^2 - 1/3 + 1$

$3(t - 1/3)^2 + 2/3$

2) $g(z) = -z^2 - 4z + 7$

D: ℝ

R: $(-\infty, 11]$

$-(z^2 + 4z \underline{+4} \underline{-4}) + 7$

$-(z+2)^2 + 4 + 7$

$-(z+2)^2 + 11$

*3) $f(z) = 2 + \sqrt{z^2 + 1}$

D: ℝ

$z^2 + 1 \geq 0$

$z^2 \geq -1$

always true

R: $[3, \infty)$ Special case!

$2 + \sqrt{z^2+1}$
↑
always 0 or greater

$2 + \sqrt{1}$

4) $h(y) = -3\sqrt{14 + 3y}$

D: $[-14/3, \infty)$

$14 + 3y \geq 0$

$3y \geq -14$

$y \geq \frac{-14}{3}$

R: $(-\infty, 0]$

$\underset{\text{always -}}{-3}\underbrace{\sqrt{14+3y}}_{\text{always 0 or +}}$

product is negative

Domain only 5) $A(x) = \frac{4}{x - 9} - \sqrt{x^2 - 36}$

D: $(-\infty, -6] \cup [6, 9) \cup (9, \infty)$

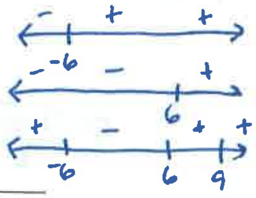
↑

$x - 9 = 0$

$x \neq 9$

$x^2 - 36 \geq 0$

$(x-6)(x+6) \geq 0$



6) $f(z) = \sqrt{z - 1} + \sqrt{z + 6}$

$z - 1 \geq 0$ $z + 6 \geq 0$

$z \geq 1$ and $z \geq -6$

D: $[1, \infty)$

R: $[0, \infty)$

$\underset{\text{0 or +}}{\sqrt{z-1}} + \underset{\text{0 or +}}{\sqrt{z+6}}$

7) $g(x) = \sqrt{10x - 15}$

D: $[3/2, \infty)$

$10x - 15 \geq 0$

$10x \geq 15$

$x \geq 3/2$

R: $[0, \infty)$

$\sqrt{10x - 15}$

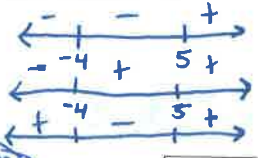
0 or +

Domain only 8) $h(z) = \sqrt{z^2 - z - 20}$

D: $(-\infty, -4] \cup [5, \infty)$ R: $[0, \infty)$

$z^2 - z - 20 \geq 0$

$(z-5)(z+4) \geq 0$



9) $M(x) = 5 - |x + 8|$

D: ℝ

R: $(-\infty, 5]$

$5 - |x + 8|$

always 0 or +

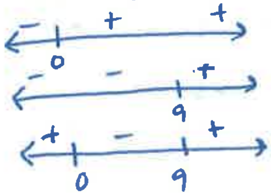
but you are subtracting it

Domain only 10) $A(z) = \sqrt{z^2 - 9z}$

D: $(-\infty, 0] \cup [9, \infty)$ R: $[0, \infty)$

$z^2 - 9z \geq 0$

$z(z - 9) \geq 0$



11) $f(x) = 9 - x$

linear

D: $\mathbb{R}$ R: $\mathbb{R}$

12) $g(x) = \sqrt{25 - x^2}$

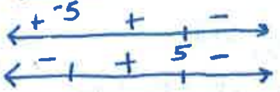
Special case!

D: $[-5,5]$ R: $[0,5]$

$25-x^2 \geq 0$

$(5-x)(5+x) \geq 0$

watch signs!



$\sqrt{25-x^2}$

$\uparrow$

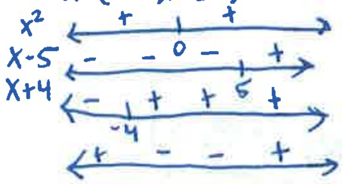
0 or +, but you're subtracting

Domain only

13) $h(x) = \sqrt{x^4 - x^3 - 20x^2}$

D: $(-\infty,-4] \cup [5,\infty)$ R: $[0,\infty)$

$x^2(x^2-x-20) \geq 0$



14) $P(z) = z^2 - 4$

parabola

D: $\mathbb{R}$ R: $[-4,\infty)$

Find the domain of the given function.

15) $f(w) = \dfrac{w^3 - 3w + 1}{12w - 7}$

D: $(-\infty, \frac{7}{12}) \cup (\frac{7}{12}, \infty)$

$12w-7=0$

$12w=7$

$w=\frac{7}{12}$

16) $R(z) = \dfrac{5}{z^3 + 10z^2 + 9z}$

D: $(-\infty,-9) \cup (-9,-1) \cup (-1,0) \cup (0,\infty)$

$z^3+10z^2+9z=0$

$z(z^2+10z+9)=0$

$z(z+9)(z+1)=0$

$z=0$ $z=-9$ $z=-1$

17) $g(t) = \dfrac{6t - t^3}{7 - t - 4t^2}$

D: $(-\infty, \frac{1+\sqrt{113}}{-8}) \cup (\frac{1-\sqrt{113}}{-8}, \infty)$

$7-t-4t^2 \neq 0$

$-4t^2-t+7 \neq 0$

$\frac{-1 \pm \sqrt{1-4(-4)(7)}}{2(-4)} = \frac{1 \pm \sqrt{113}}{-8}$

plug into calculator to see which one is larger

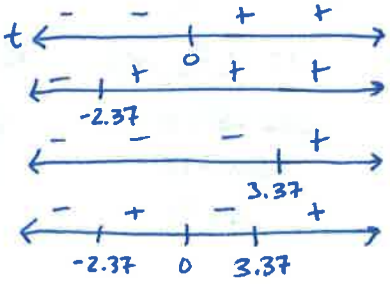
18) $P(t) = \dfrac{5t + 1}{\sqrt{t^3 - t^2 - 8t}}$

D: $(\frac{1-\sqrt{33}}{2}, 0) \cup (\frac{1+\sqrt{33}}{2}, \infty)$

$t^3-t^2-8t>0$

$t(t^2-t-8)>0$

$\frac{1 \pm \sqrt{1-4(1)(-8)}}{2(1)} = \frac{1 \pm \sqrt{33}}{2}$



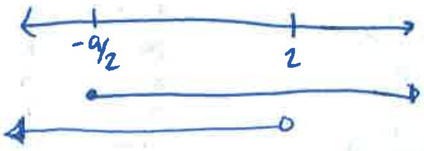
19) $h(y) = \sqrt{2y + 9} - \dfrac{1}{\sqrt{2 - y}}$

D: $[-\frac{9}{2}, 2)$

$2y+9 \geq 0$ AND $2-y>0$

$2y \geq -9$ $-y>-2$

$y \geq -\frac{9}{2}$ $y<2$



20) $Q(y) = \sqrt{y^2 + 1} - \sqrt[3]{1 - y}$

D: $\mathbb{R}$

$y^2+1 \geq 0$ AND can be + or − since it's cube root

$y^2 \geq -1$

always

$\mathbb{R}$ $\mathbb{R}$

21) $h(x) = \frac{2 + x}{8x - 1}$

D: $(-\infty, 1/8) \cup (1/8, \infty)$

$8x - 1 = 0$

$x = 1/8$

22) $A(t) = \frac{t^2 - 4}{t^2 + 6t - 7}$

D: $(-\infty, -7) \cup (-7, 1) \cup (1, \infty)$

$t^2 + 6t - 7 = 0$

$(t + 7)(t - 1) = 0$

$t = -7 \quad t = 1$

23) $h(w) = \frac{w^2 + 3w + 2}{w^2 + 12w + 36}$

D: $(-\infty, -6) \cup (-6, \infty)$

$w^2 + 12w + 36 = 0$

$(w + 6)(w + 6) = 0$

$w = -6$

24) $f(t) = \frac{10t}{\sqrt{6 - 4t}}$

D: $(-\infty, 3/2)$

$6 - 4t > 0$

$-4t > -6$

$t < 3/2$

25) $f(w) = \frac{\sqrt{w + 7}}{\sqrt{2 - w}}$

D: ~~$(-\infty, 2)$~~ $[-7, 2)$

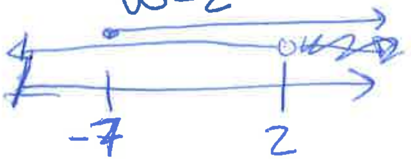
$2 - w > 0$

$-w > -2$

$w < 2$

$w + 7 \geq 0$

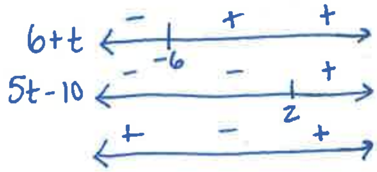
$w \geq -7$



26) $g(t) = \sqrt{\frac{6 + t}{5t - 10}}$

D: $(-\infty, -6] \cup (2, \infty)$

same as $\frac{6+t}{5t-10} > 0$



27) Create a function whose domain is all real numbers and range is (-2,∞).

Answers vary. Ex: $f(x) = -2 + |3x^2 - 1|$

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3) $f(z) = 2 + \sqrt{z^2 + 1}$

4) $h(y) = -3\sqrt{14 + 3y}$

5) $A(x) = \dfrac{4}{x - 9} - \sqrt{x^2 - 36}$

6) $f(z) = \sqrt{z - 1} + \sqrt{z + 6}$

7) $g(x) = \sqrt{10x - 15}$

8) $h(z) = \sqrt{z^2 - z - 20}$

9) $M(x) = 5 - |x + 8|$

10) $A(z) = \sqrt{z^2 - 9z}$

11) $f(x) = 9 - x$

12) $g(x) = \sqrt{25 - x^2}$

13) $h(x) = \sqrt{x^4 - x^3 - 20x^2}$

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Find the domain of the given function.

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16) $R(z) = \dfrac{5}{z^3 + 10z^2 + 9z}$

17) $g(t) = \dfrac{6t - t^3}{7 - t - 4t^2}$

18) $P(t) = \dfrac{5t + 1}{\sqrt{t^3 - t^2 - 8t}}$

19) $h(y) = \sqrt{2y + 9} - \dfrac{1}{\sqrt{2 - y}}$

20) $Q(y) = \sqrt{y^2 + 1} - \sqrt[3]{1 - y}$

21) $h(x) = \frac{2 + x}{8x - 1}$

22) $A(t) = \frac{t^2 - 4}{t^2 + 6t - 7}$

23) $h(w) = \frac{w^2 + 3w + 2}{w^2 + 12w + 36}$

24) $f(t) = \frac{10t}{\sqrt{6 - 4t}}$

25) $f(w) = \frac{\sqrt{w + 7}}{\sqrt{2 - w}}$

26) $g(t) = \sqrt{\frac{6 + t}{5t - 10}}$

27) Create a function whose domain is all real numbers and range is (-2,∞).