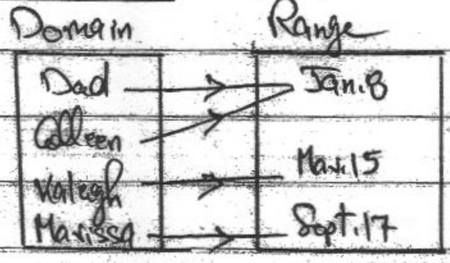
Section 3.1 :

Dr. ZABDAWI

#15)



It is a function.

Domain = {Dad, Colleen, Valeigh, Marissa}

Range = {Jan.8, Mar.15, Sept.17}

#20) $\{(-2,5),(-1,3),(3,7),(4,12)\}$

It is a function.

Domain = $\{-2,-1,3,4\}$

Range = $\{5,3,7,12\}$

#25) $\{(-2,4),(-1,1),(0,0),(1,1)\}$

It is a function

Domain = $\{-2,-1,0,1\}$

Range = $\{4,1,0\}$

#30) $f(x) = \dfrac{x^2-1}{x+4}$

a) $f(0) = \dfrac{0^2-1}{0+4} = -\dfrac{1}{4}$, b) $f(1) = \dfrac{1^2-1}{1+4} = 0$

c) $f(-1) = \dfrac{(-1)^2-1}{-1+4} = 0$, d) $f(-x) = \dfrac{(-x)^2-1}{-x+4} = \dfrac{x^2-1}{4-x}$

e) $-f(x) = -\left(\dfrac{x^2-1}{x+4}\right) = \dfrac{1-x^2}{x+4}$

f) $f(x+1) = \dfrac{(x+1)^2-1}{x+1+4} = \dfrac{x^2+2x+1-1}{x+5} = \dfrac{x^2+2x}{x+5}$

g) $f(2x) = \dfrac{(2x)^2-1}{2x+4} = \dfrac{4x^2-1}{2x+4}$

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Continue #30)

h) $f(x+h) = \dfrac{(x+h)^2-1}{x+h+4} = \dfrac{x^2+2xh+h^2-1}{x+h+4}$

#35) $y = x^2$

It is a function

#40) $y = \pm\sqrt{1-2x}$ Not a function, 'cause for any value of x in the domain, we get two values of y in the range.

ex. for $x = -10$

$y = \pm\sqrt{1-2(-10)} = \pm\sqrt{21}$

So we have $(-10, -\sqrt{21})$ and $(-10, +\sqrt{21})$

Not a function.

#45) $2x^2 + 3y^2 = 1$

$\dfrac{x^2}{1/2} + \dfrac{y^2}{1/3} = 1$ This is an equation of an ellipse.

Not a function.

#50) $f(x) = \dfrac{x^2}{x^2+1}$

Notice that $x^2+1 \neq 0$ 'cause it is the summation of two squares.

i.e. $x^2+1 = x^2+1^2$ which is never zero

$\therefore$ Domain is $x \in (-\infty, +\infty)$.

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#55) $h(x) = \sqrt{3x-12}$

$3x - 12 \geqslant 0 \Rightarrow 3x \geqslant 12 \Rightarrow x \geqslant 4$

$\Rightarrow x \in [4, +\infty)$.

#60) $g(x) = \sqrt{-x-2}$

$-x-2 \geqslant 0$

$\Rightarrow -x \geqslant 2 \Rightarrow x \leqslant -2$

$\Rightarrow$ Domain: $x \in (-\infty, -2]$

#74) 'Cause I like that problem

$$G(x) = \frac{x+4}{x^3-4x} = \frac{x+4}{x(x^2-4)}$$

$x(x^2-4) \neq 0$

$\Rightarrow \quad x \neq 0 \quad \Big| \quad x^2 - 4 \neq 0$

$x^2 \neq 4 \Rightarrow x \neq \pm 2$

$\therefore$ Domain $= \{x \mid x \neq 0, \pm 2\}$

OR

$x \in (-\infty, -2) \cup (-2, 0) \cup (0, 2) \cup (2, +\infty)$

This means that the domain is everything except $\{-2, 0, 2\}$.

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#50) 'Cause I like it!

$$f(x) = \frac{x}{\sqrt{x-4}}$$

$x-4 > 0 \implies x > 4 \implies$ Domain: $x \in (4, +\infty)$

#65) $f(x) = \sqrt{x}$, $g(x) = 3x-5$

a) $f+g = \sqrt{x} + 3x - 5$.
Domain $x \geq 0 \implies x \in [0, +\infty)$

b) $f-g = \sqrt{x} - (3x-5) = \sqrt{x} - 3x + 5$
Domain $x \geq 0 \implies x \in [0, +\infty)$

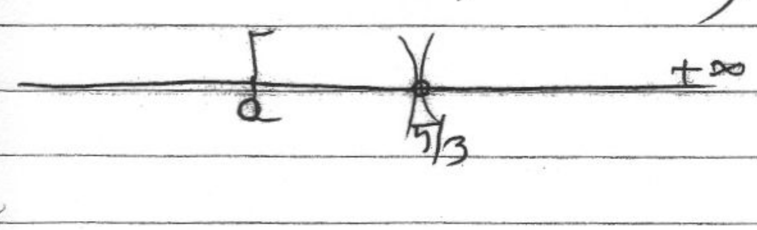
c) $f.g = \sqrt{x}(3x-5)$; Domain: $x \geq 0 \implies x \in [0, +\infty)$

d) $\frac{f}{g} = \frac{\sqrt{x}}{3x-5}$

Here we have two restrictions:

1) $x \geq 0 \implies x \in [0, +\infty)$
2) $3x - 5 \neq 0 \implies x \neq \frac{5}{3}$

$\implies$ Domain is: $x \in \left[0, \frac{5}{3}\right) \cup \left(\frac{5}{3}, +\infty\right)$



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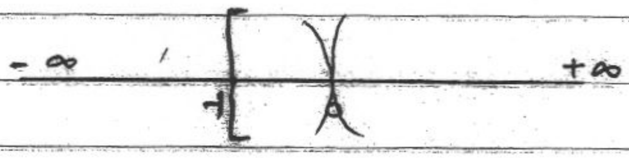
#7) $f(x) = \sqrt{x+1}$, $g(x) = \frac{2}{x}$

a) $(f+g)(x) = f(x) + g(x) = \sqrt{x+1} + \frac{2}{x}$

1) $x+1 \geq 0 \Rightarrow x \geq -1 \Rightarrow x \in [-1, +\infty)$

2) $x \neq 0$

Combining (1) + (2) $\rightarrow$ Domain : $x \in [-1, 0) \cup (0, +\infty)$



b) $(f-g)(x) = f(x) - g(x) = \sqrt{x+1} - \frac{2}{x}$; Domain : $x \in [-1, 0) \cup (0, +\infty)$

c) $(f \cdot g)(x) = f(x) \cdot g(x) = \sqrt{x+1} \cdot \frac{2}{x}$; Domain $x \in [-1, 0) \cup (0, +\infty)$

d) $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \sqrt{x+1} \div \frac{2}{x} = \sqrt{x+1} \cdot \frac{x}{2}$

$$\frac{f}{g} = \frac{x\sqrt{x+1}}{2}$$

$x+1 \geq 0 \Rightarrow x \geq -1$

But bear in mind that $x \neq 0$ for $g(x)$.

So the Domain for $\frac{f}{g}$ is $x \in [-1, 0) \cup (0, +\infty)$.