MAT 121 §1.1 #s 7, 17, 31, 36, 51, 59, 69, 73, 75, 92

(7) If $\mathcal{D}(f) = [0,7]$ & $\mathcal{D}(g) = [-2,5]$, then $\mathcal{D}(f+g)$
$= [0,7] \cap [-2,5] = \boxed{[0,5] = \mathcal{D}(f+g)}$

(17) Determine if it's a function. If so, state $\mathcal{D}$ & $\mathcal{R}$.

20 hrs → \$200
20 hrs → \$300
30 hrs → \$350
40 hrs → \$425

Not a function
20 corresponds to 2 different values.

(31) $y^2 = 4 - x^2$ is $\boxed{\text{not a function}}$ of x, since
$y^2 = 4 - x^2 \implies y = \pm\sqrt{4-x^2}$ and we see that there's more than one y-value for each x-value.

(36) $y = \dfrac{3x-1}{x+2}$ $\boxed{\text{is a rational function}}$

(51) $g(x) = \dfrac{x}{x^2-16}$. Its domain is found by excluding $\{x \mid x^2 - 16 = 0\} = \{x \mid x = \pm 4\}$,
i.e., $\boxed{\mathcal{D}(g) = \{x \mid x \neq \pm 4\}} = \mathbb{R} \setminus \{\pm 4\}$
$= (-\infty, -4) \cup (-4, 4) \cup (4, \infty)$

(59) $f(x) = \sqrt{\dfrac{2}{x-1}}$. For its domain, we need $\dfrac{2}{x-1} \geq 0$ AND $x - 1 \neq 0$, i.e., we need $x - 1 > 0 \implies x > 1$, so $\mathcal{D}(f) = \{x \mid x > 1\}$
$= (1, \infty)$

MAT 121 §1.1 #s 69, 73, 75, 92

#s 61–70, find all these different functions...

(69) $f(x) = \frac{2x+3}{3x-2}$, $g(x) = \frac{4x}{3x-2}$ $\mathcal{D}$: Need $3x-2 \neq 0$
$3x \neq 2$
$x \neq \frac{2}{3}$

(a) $(f+g)(x) = \frac{2x+3}{3x-2} + \frac{4x}{3x-2} = \frac{6x+3}{3x-2}$ $\boxed{\mathcal{D} = \mathbb{R} \setminus \{\frac{2}{3}\}}$

(b) $(f-g)(x) = \frac{2x+3}{3x-2} - \frac{4x}{3x-2} = \frac{2x+3-4x}{3x-2} = \frac{-2x+3}{3x-2}$. $\boxed{\mathcal{D} = \mathbb{R} \setminus \{\frac{2}{3}\}}$

(c) $(f \cdot g)(x) = f(x) \cdot g(x) = \frac{2x+3}{3x-2} \cdot \frac{4x}{3x-2} = \frac{(2x+3)(4x)}{(3x-2)(3x-2)}$

$= \boxed{\frac{8x^2+12x}{(3x-2)^2}}$ whether or not you'd expand the $(2x+3)(4x)$ depends on the situation. No preference on this one. $\boxed{\mathcal{D} = \mathbb{R} \setminus \{\frac{2}{3}\}}$

same as previous domains.

(d) $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} =$

$= \frac{\frac{2x+3}{3x-2}}{\frac{4x}{3x-2}} = \frac{2x+3}{3x-2} \cdot \frac{3x-2}{4x} = \frac{2x+3}{4x}$

For $\mathcal{D}\left(\frac{f}{g}\right)$, we need to keep f & g both happy, as before, AND we can't let $g(x) = 0$:

$\frac{2x+3}{4x} = 0 \Longrightarrow 2x+3 = 0 \longrightarrow x \neq -\frac{3}{2}$

So $\mathcal{D}\left(\frac{f}{g}\right) = \{x \mid x \neq \frac{2}{3} \text{ AND } x \neq -\frac{3}{2}\}$

(e) $(f+g)(3) = \frac{6(3)+3}{3(3)-2} = \frac{21}{7} = \boxed{3 = (f+g)(3)}$ (See part (a))

(f) $(f-g)(4) = \frac{2(4)+3}{3(4)-2} = \boxed{\frac{11}{10} = (f-g)(4)}$ (See part (b))

(g) $(f \cdot g)(2) = \frac{8(2)^2+12(2)}{(3(2)-2)^2} = \frac{32+24}{(4)^2} = \frac{56}{16} = \boxed{\frac{7}{2} = (f \cdot g)(2)}$

(h) $\left(\frac{f}{g}\right)(1) = \frac{2(1)+3}{4(1)} = \boxed{\frac{5}{4} = \left(\frac{f}{g}\right)(1)}$

MAT 121 §1.1 #s 73, 75, 92

#s 73–78. Find the difference quotient of f, i.e., $\dfrac{f(x+h)-f(x)}{h}$

(73) $f(x) = 4x+3$

$$\Rightarrow \frac{f(x+h)-f(x)}{h}$$

$$= \frac{4(x+h)+3-(4x+3)}{h}$$

$$= \frac{4x+4h+3-4x-3}{h}$$

$$= \frac{4h}{h}$$

$$= \boxed{4 = \frac{f(x+h)-f(x)}{h}}$$

(75) $f(x) = x^2 - x + 4$

$$\Rightarrow \frac{f(x+h)-f(x)}{h}$$

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

$$= \frac{x^2+2xh+h^2-x-h+4-x^2+x-4}{h}$$

$$= \frac{2xh+h^2-h}{h}$$

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

(92) $H(x) = 20-13x^2$ represents the height H (in meters) after x seconds, when an object is dropped from a height of 20 meters

(a) What is the height when $x = 1$ second? $x = 1.1$ seconds, $x = 1.2$ s?

(b) When is the height 15 m?

(a) $H(1) = 20 - 13(1)^2 =$

$H(1.1) = 20 - 13(1.1)^2$

$=$

$H(1.2) = 20 - 13(1.2)^2$

$=$

(b) SET $H(x) = 20 - 13x^2 = 15$

$\Rightarrow 13x^2 - 5 = 0$

$\Rightarrow 13x^2 = 5$

$\Rightarrow x^2 = \frac{5}{13}$

$\Rightarrow x = \pm\sqrt{\frac{5}{13}}$

$\boxed{x = +\sqrt{\frac{5}{13}} \text{ sec} \Rightarrow H = 15}$

(c) It hits the ground when $\boxed{x = \sqrt{\frac{20}{13}}}$ seconds when $H = 0$

$20 - 13x^2 = 0 \Rightarrow 20 = 13x^2 \Rightarrow \boxed{x = \sqrt{\frac{20}{13}}}$

MAT 121 Spr '09 §1.1

Functions

For conscientious self-assessors:

Recall the "standard rubric" (for now)

3pts per prob.

1 pt - Are the instructions apparent?

1 pt - Is supporting work apparent/clear

1 pt - Final answer.

I'm shooting to look @ 3 probs, usually

For "long probs" I might go to more of

a 3-pt scale for how much is done correctly

These problems tend to become 5-pointers.

giving some students bonus points

unlooked for.

MAPS & ORDERED PAIRS Lec.

Heads-up for next time:

Read §1.2 - Know the answers to

#s 1-8, or know to ask me about it.