Exam 1 Review

Wednesday, February 6, 2019 1:09 PM

MC section

1. Not a function.

Reason: the input $x=2$ corresponds to 2 outputs

$y=-8$ and $y=-9$.

2. $f(x) = 3x^2 - 4x + 2$. Find $f(x-1)$.

$$f(x-1) = 3(x-1)^2 - 4(x-1) + 2$$

$$= 3(x-1)(x-1) - 4(x-1) + 2$$

$$= 3(x^2 - 2x + 1) - 4(x-1) + 2$$

$$= 3x^2 - 6x + 3 - 4x + 4 + 2$$

$$\boxed{f(x-1) = 3x^2 - 10x + 9}$$

3. $f(x) = \dfrac{x}{7-x}$; Find $f\left(-\frac{4}{5}\right)$

$$f\left(-\frac{4}{5}\right) = \frac{-\frac{4}{5}}{7-\left(-\frac{4}{5}\right)} = \frac{-\frac{4}{5}}{\frac{7\cdot 5}{1\cdot 5} + \frac{4}{5}} = \frac{-\frac{4}{5}}{\frac{35+4}{5}}$$

$$= \frac{-\frac{4}{5}}{\frac{39}{5}} = -\frac{4}{\cancel{5}} \cdot \frac{\cancel{5}}{39} = \boxed{-\frac{4}{39}}$$

(4) When $x = 0$; $y = -2$. So, $\boxed{g(0) = -2}$

(5) Domain (x-axis) $= (-2, 1]$

not included included

Range (y-axis) $= [1, 4)$

included not included

(6) When $y = 0$, $x = -6, 7, 10$

Answer: $\boxed{-6, 7, 10}$

(7) Symmetric with respect to origin.

(8) $4x^2 + 6x + 1 = 0$; $a = 4$; $b = 6$; $c = 1$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-6 \pm \sqrt{36 - 16}}{8}$$

$$x = \frac{-6 \pm \sqrt{20}}{8} = \frac{-6 \pm 2\sqrt{5}}{8} = \boxed{\frac{-3 \pm \sqrt{5}}{4}}$$

$$\frac{\cancel{2}(-3 \pm \sqrt{5})}{\cancel{8}\ 4}$$

9. $x^2 + xy^2 = 5$

Symmetry w.r.t. x-axis: Substitute $-y$ for y.

$x^2 + x\cdot(-y)^2 = 5$

$\rightarrow$ Simplify: $x^2 + x\cdot y^2 = 5$ $\rightarrow$ Same as original.

Yes, symmetric w.r.t. x-axis

Symmetry w.r.t. y-axis: Substitute $-x$ for x

$(-x)^2 + (-x)\cdot y^2 = 5$

$\rightarrow$ Simplify: $x^2 - xy^2 = 5$ $\rightarrow$ Different from original

No, NOT symmetric w.r.t. y-axis.

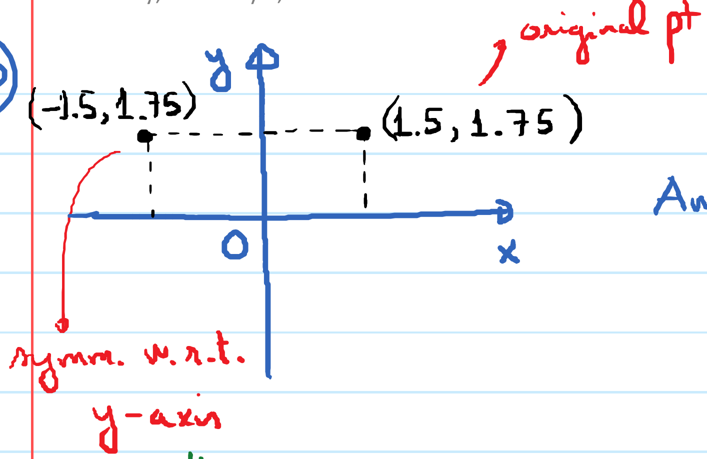
Symmetry w.r.t. Origin: Substitute $-x$ for x and substitute $-y$ for y

$(-x)^2 + (-x)\cdot(-y)^2 = 5$

$\rightarrow$ Simplify: $x^2 - xy^2 = 5$ $\rightarrow$ Different.

NOT symmetric w.r.t origin.

(10)



Answer: $(-1.5, 1.75)$

SA. section

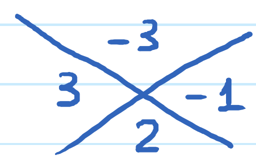
(11) Domain (x-axis) $= \boxed{[-4, 4]}$

(12) $2 - 10x = (3x - 7)(x + 1)$

$$2 - 10x = 3x^2 + 3x - 7x - 7$$

$$2 - 10x = 3x^2 - 4x - 7$$

$$0 = 3x^2 + 6x - 9$$



$$0 = 3(x^2 + 2x - 3)$$

$$0 = 3(x + 3)(x - 1)$$

$x + 3 = 0$ or $x - 1 = 0$

$\boxed{x = -3}$ or $\boxed{x = 1}$

13. $(4x+3)^2 = 7 \longrightarrow$ Root Extraction

$$4x+3 = \pm\sqrt{7}$$

$$4x = -3 \pm \sqrt{7}$$

$$\boxed{x = \frac{-3 \pm \sqrt{7}}{4}}$$

14. $x^2 - 12x.$ $\quad \left(\text{Half of } b\right)^2 = (-6)^2 = \boxed{36}$

$$x^2 - 12x + 36 = \boxed{(x-6)^2}$$

36

-6 $\quad$ -6

-12

15. $$\left(x^2+6x+9\right)^{3/4} - 10 = 17$$

$$\left(x^2+6x+9\right)^{3/4} = 27$$ (Add 10 to both sides)

$$\left[\left(x^2+6x+9\right)^{3/4}\right]^{4/3} = (27)^{4/3}$$ (Raise both sides to the 4/3)

$$x^2+6x+9 = \left(\sqrt[3]{27}\right)^4$$ (Formula: $a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m$)

$$x^2+6x+9 = 81$$

$$x^2 + 6x - 72 = 0$$

$$\begin{array}{ccc} & -72 & \\ 12 & \times & -6 \\ & 6 & \end{array}$$

$$(x+12)(x-6) = 0$$

$$x = -12 \quad \text{or} \quad x = 6$$

Check: $\boxed{x = -12}$: $\left(\underbrace{(-12)^2 + 6\cdot(-12) + 9}\right)^{3/4} - 10 \overset{?}{=} 17$

is a solution

$$(81)^{3/4} - 10 \overset{?}{=} 17$$

$$27 - 10 = 17 \checkmark$$

$\boxed{x=6}$: $(6^2 + 6.6 + 9)^{3/4} - 10 \overset{?}{=} 17$

is a solution

$$(81)^{3/4} - 10 = 17 \checkmark$$

Conclusion: Solution set : $\boxed{\{-12, 6\}}$

(16) $5x^3 + 3x^2 = 80x + 48$

$$\underbrace{5x^3 + 3x^2}\ \underbrace{-\ 80x - 48} = 0$$

$$x^2\boxed{(5x+3)} - 16\boxed{(5x+3)} = 0$$

$$(5x+3)(x^2 - 16) = 0$$

$$5x + 3 = 0 \quad \text{or} \quad x^2 - 16 = 0$$

$$\boxed{x = -\frac{3}{5}} \qquad \boxed{x = \pm 4}$$

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$$f(x) = x^2 + 7x + 9.$$

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

$$f(x+h) = (x+h)^2 + 7(x+h) + 9$$

$$= (x+h)(x+h) + 7(x+h) + 9$$

$$f(x+h) = x^2 + 2xh + h^2 + 7x + 7h + 9.$$

$$\frac{f(x+h) - f(x)}{h} = \frac{\cancel{x^2} + 2xh + h^2 + \cancel{7x} + 7h + \cancel{9} \cancel{-x^2} \cancel{-7x} \cancel{-9}}{h}$$

$$= \frac{2xh + h^2 + 7h}{h}$$

$$= \frac{\cancel{h}(2x + h + 7)}{\cancel{h}}$$

$$= \boxed{2x + h + 7} \longrightarrow \text{Answer.}$$

18

$$\boxed{x^{2/3}}^{\,u^2} + 3\boxed{x^{1/3}}^{\,u} - 4 = 0$$

Let $u = x^{1/3}$. Then $u^2 = x^{2/3}$

$$u^2 + 3u - 4 = 0$$

$$\begin{array}{ccc} & -4 & \\ -1 & & 4 \\ & 3 & \end{array}$$

$$(u-1)(u+4) = 0 \longrightarrow u = 1 \text{ or } u = -4$$

So, $x^{1/3} = 1$ or $x^{1/3} = -4$

$x = (1)^3 = 1$ or $x = (-4)^3 = -64$

Solution set

$$\boxed{\{1, -64\}}$$

Essay

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$$20x^3 + 100x^2 + 120x = 0$$

$$20x(x^2 + 5x + 6) = 0$$

$$20x(x+2)(x+3) = 0$$

$$20x = 0 \quad \text{or} \quad x+2=0 \quad \text{or} \quad x+3=0$$

$$\boxed{x=0} \quad \text{or} \quad \boxed{x=-2} \quad \text{or} \quad \boxed{x=-3}$$

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$$x - \sqrt{3x-2} = 4$$

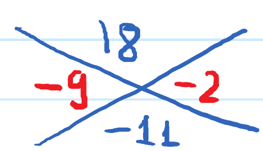
$$-\sqrt{3x-2} = 4-x$$

$$\left(-\sqrt{3x-2}\right)^2 = (4-x)^2 \quad \text{(Square both sides)}$$

$$3x-2 = (4-x)(4-x)$$

$$3x-2 = 16 - 8x + x^2$$

$$0 = x^2 - 11x + 18$$



$$0 = (x-9)(x-2)$$

$$x-9=0 \quad \text{or} \quad x-2=0$$

$$x=9 \quad \text{or} \quad x=2.$$

Check: $\boxed{x = 9}$.

$$9 - \sqrt{3\cdot(9) - 2} \stackrel{?}{=} 4$$

$$9 - \sqrt{25} = 4$$

$$9 - 5 = 4 \checkmark$$

is a solution

Check: $\boxed{x = 2}$.

$$2 - \sqrt{3\cdot(2) - 2} \stackrel{?}{=} 4$$

$$2 - \sqrt{4} \stackrel{?}{=} 4$$

$$2 - 2 \cancel{=} 4$$

not a solution.

Conclusion: Solution set $\boxed{\{9\}}$