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MATH 101: FALL 2020

QUIZ 3

You are allowed one page of notes and a calculator. No phones. More than 25pts to earn. **Box** your answers for full credit and show work. Thanks!

Problem 1: (2pts) Find domain in interval notation for $f(x) = \frac{2x-3}{x+7}$

$$\text{Need } x+7 \neq 0 \Rightarrow x \neq -7$$

$$\therefore \text{dom}(f(x)) = (-\infty, -7) \cup (-7, \infty)$$

Problem 2: (2pts) Simplify $\frac{84x^{53}}{2x^{11}} = 42x^{53-11} = 42x^{42}$

Problem 3: (2pts) Simplify $\frac{\frac{1}{x}-2}{\frac{1}{x}+3} = \frac{x(\frac{1}{x}-2)}{x(\frac{1}{x}+3)} = \frac{1-2x}{1+3x}$

Problem 4: (2pts) Simplify $\frac{x^3}{4x+16} \cdot \frac{9x+36}{x^2} = \frac{x^3}{4(x+4)} \cdot \frac{9(x+4)}{x^2}$

$$= \frac{9x}{4}$$

Problem 5: (2pts) Simplify $\frac{x^2-16}{2x^2+6x-8} \cdot \frac{4x^2-4x}{x-1} =$

$$\rightarrow = \frac{(x-4)(x+4)}{2(x^2+3x-4)} \cdot \frac{4x(x-1)}{x-1}$$
$$= \frac{(x-4)(x+4)}{2(x+4)(x-1)} \cdot \frac{4x(x-1)}{x-1}$$
$$= \frac{2x(x-4)}{x-1}$$

Problem 6: (2pts) Simplify $\frac{3x+25x^4-90x^6}{15x^2} = \frac{3x}{15x^2} + \frac{25x^4}{15x^2} - \frac{90x^6}{15x^2}$

$$= \frac{1}{5x} + \frac{5x^2}{3} - 6x^4$$

Problem 7: (2pts) Simplify $\frac{8a^3}{16a^5 - 40a^3 + 2a} = \frac{8a^3}{2a(8a^4 - 20a^2 + 1)}$

$$= \boxed{\frac{4a^2}{8a^4 - 20a^2 + 1}}$$

Problem 8: (2pts) Simplify $\sqrt[3]{-64x^9} = \sqrt[3]{-1} \sqrt[3]{64} \sqrt[3]{x^9}$

$$= (-1)(4)x^{9/3}$$
$$= \boxed{-4x^3}$$

Problem 9: (2pts) Rewrite the expression as to rationalize the denominator: $\frac{8}{3 + \sqrt{7}}$

$$\left(\frac{8}{3 + \sqrt{7}}\right)\left(\frac{3 - \sqrt{7}}{3 - \sqrt{7}}\right) = \frac{24 - 8\sqrt{7}}{3^2 + \sqrt{7} \cdot 3 - 3\sqrt{7} - (\sqrt{7})^2}$$
$$= \frac{24 - 8\sqrt{7}}{9 - 7}$$
$$= \frac{24}{2} - \frac{8}{2}\sqrt{7} = \boxed{12 - 4\sqrt{7}}$$

Problem 10: (2pts) Find the Cartesian form of the complex number $\frac{100}{3 + 4i}$

$$\left(\frac{100}{3 + 4i}\right)\left(\frac{3 - 4i}{3 - 4i}\right) = \frac{100(3 - 4i)}{9 + 12i - 12i - 16i^2}$$
$$= \frac{100(3 - 4i)}{25}$$
$$= 4(3 - 4i)$$
$$= \boxed{12 - 16i}$$

Problem 11: (2pts) Solve $\frac{x}{3} - \frac{x}{7} = 11$

$$\frac{7x}{21} - \frac{3x}{21} = \frac{4x}{21} = 11 \Rightarrow 4x = 11(21)$$

$$x = \frac{11(21)}{4} = \frac{231}{4}$$

Problem 12: (2pts) Solve $\frac{x+1}{x+2} = \frac{4}{5}$

$$5(x+1) = 4(x+2)$$

$$5x + 5 = 4x + 8$$

$$5x - 4x = 8 - 5$$

$$x = 3$$

Problem 13: (2pts) Solve $\sqrt{5x+19} - 2 = 1$.

$$(\sqrt{5x+19})^2 = (3)^2$$

$$5x + 19 = 9$$

$$5x = -10$$

$$x = \frac{-10}{5}$$

$$\therefore x = -2$$

$$\left(\begin{array}{l} \text{it checks,} \\ \sqrt{-10+19} = \sqrt{9} = 3 \end{array} \right)$$

Problem 14: (2pts) Solve $x = 8 + \sqrt{x-6}$.

$$x - 8 = \sqrt{x-6}$$

$$(x-8)^2 = (\sqrt{x-6})^2 = x-6$$

$$x^2 - 16x + 64 = x - 6$$

$$x^2 - 17x + 70 = 0$$

$$(x-10)(x-7) = 0 \Rightarrow x = 10 \text{ or } x = 7$$

However, $8 + \sqrt{7-6} = 8 + 1 = 9 \neq 7$ thus $x=7$ not a solⁿ.

And, ~~$8 + \sqrt{10-6} = 8 + 2 = 10$~~ $8 + \sqrt{10-6} = 8 + \sqrt{4} = 10 \therefore x = 10$