MATA103 FINAL REVIEW

1. $\left(\frac{4}{3}\right)^{-3}$

$= \left(\frac{3}{4}\right)^{3} = \frac{3^3}{4^3} = \frac{27}{64}$ D

2. $\frac{5m^{-3}n^{-2}}{8p^{-4}}$

$= \frac{5p^4}{8m^3n^2}$ A

3. $(-7x^{-2})(7x^{-4})$

$= (-7)(7)(x^{-2})(x^{-4}) = -49x^{-6} = -\frac{49}{x^6}$ D

4. $(x^{-5}y^6)^{-2}$

$= (x^{-5})^{-2}(y^6)^{-2} = x^{+10}y^{-12} = \frac{x^{10}}{y^{12}}$ C

5. $\left(\frac{7x^{-1}}{5y^{-1}}\right)^{-2}$

$= \left(\frac{7y}{5x}\right)^{-2} = \left(\frac{5x}{7y}\right)^{2} = \frac{25x^2}{49y^2}$ B

6. $0.000074 = 7.4 \times 10^{-5}$ D

7. $8y + 4(2+y) = 3(y-4) + 10y$ B

$8y + 8 + 4y = 3y - 12 + 10y$

$12y + 8 = 13y - 12$

$20 = y$

8. $\frac{2}{5}x - \frac{1}{3}x = 3$ — A

LCD = 15

$15\left(\frac{2}{5}x\right) - 15\left(\frac{1}{3}x\right) = 15 \cdot 3$

$6x - 5x = 45$

$x = 45$

9. $2x + 5y = 9x + 4$

$5y = 7x + 4$

$y = \frac{7}{5}x + \frac{4}{5}$ — C

10. $S = 2\pi rh + 2\pi r^2$

$2\pi rh = S - 2\pi r^2$

$h = \frac{S - 2\pi r^2}{2\pi r}$ — A

11. $5 - 3(1 - x) \leq 20$

$5 - 3 + 3x \leq 20$

$2 + 3x \leq 20$

$3x \leq 18$

$x \leq 6$ — D

12. $-17 \leq -3x + 1 < -11$

$-18 \leq -3x < -12$

$\frac{-18}{-3} \geq x > \frac{-12}{-3}$ ← SYMBOLS REVERSED BECAUSE WE DIVIDED BY A NEGATIVE VALUE

$6 \geq x > 4 \Rightarrow 4 < x \leq 6 \Rightarrow (4, 6]$ — A

13. $|6m+8|+2=9$

$|6m+8|=7$

$6m+8=7$ OR $6m+8=-7$

$6m=-1$ $\quad$ $6m=-15$

$m=-\frac{1}{6}$ $\quad$ $m=-\frac{15}{6}=-\frac{5}{2}$ A

14. $|2m+8|<9$

$2m+8<9$ OR $2m+8>-9$

$2m<1$ $\quad$ $2m>-17$

$m<\frac{1}{2}$ $\quad$ $m>-\frac{17}{2}$

$-\frac{17}{2}<m<\frac{1}{2}$ A

15. $|8m+2|+4\geq 9$

$|8m+2|\geq 5$

$8m+2\geq 5$ OR $8m+2\leq -5$

$8m\geq 3$ $\quad$ $8m\leq -7$

$m\geq \frac{3}{8}$ $\quad$ $m\leq -\frac{7}{8}$ C

16. $|8s+3|=|s-4|$

$8s+3=s-4$ OR $8s+3=-(s-4)$

$7s=-7$ $\quad$ $8s+3=-s+4$

$s=-1$ $\quad$ $9s=1$

$s=\frac{1}{9}$ D

17. NOT A FUNCTION (MORE THAN 1 Y VALUE FOR SAME X)

DOMAIN (X) IS $-7\leq x\leq 7$

RANGE (Y) IS $-2\leq y\leq 2$ C

18. $f(x) = x^2 + 3x - 6$ find $f(-3)$

$f(-3) = (-3)^2 + 3(-3) - 6$

$= 9 - 9 - 6$

$= -6$ D

19. $2x + 9y = -49$

$8x + 3y = 35$

$2x + 9y = -49$

$-3(8x + 3y) = (35)\,-3$

$2x + 9y = -49$

$-24x - 9y = -105$

$-22x = -154$

$x = \frac{-154}{-22} = 7$

$-4(2x + 9y) = (-49)\,-4$

$8x + 3y = 35$

$-8x - 36y = +196$

$8x + 3y = 35$

$-33y = 231$

$y = \frac{231}{-33} = -7$

ANS = $(7, -7)$ C

20. $-5x - 30y = 30$

Y-INTERCEPT: WHEN $x = 0$ $-5(0) - 30y = 30$

$-30y = 30$

$y = \frac{30}{-30} = -1$ $(0, -1)$

X-INTERCEPT: WHEN $y = 0$ $-5x - 30(0) = 30$

$-5x = 30$

$x = \frac{30}{-5} = -6$ $(-6, 0)$

21. $C = 40 + 2x = 2x + 40$

WHEN $x = 8$ MILES $\quad C = 2(8) + 40$

$= 16 + 40$

$= \$56$ B

22. $(+5, -5)$ & $(-2, +5)$

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - (-5)}{-2 - 5} = \frac{5+5}{-7}$

$= \frac{10}{-7} = -\frac{10}{7}$ A

23. $9x - 11y - 99 = 0$

$-11y = -9x + 99$

$y = \frac{-9}{-11}x + \frac{99}{-11} = \frac{9}{11}x - 9$

SLOPE $= \frac{9}{11}$

Y-INTERCEPT $= -9$ D

24. $f(x) = 2x - 3$

Y-INTERCEPT $= (0, -3)$

SLOPE $= 2$

25. $(-5x^2 + 9x - 4) - (-2x^2 - 5x + 3)$ B

$-5x^2 + 9x - 4 + 2x^2 + 5x - 3$

$-5x^2 + 2x^2 + 9x + 5x - 4 - 3$

$-3x^2 + 14x - 7$

26. $(x - 11)(x^2 + 9x - 5)$

$= x(x^2 + 9x - 5) - 11(x^2 + 9x - 5)$

$= x^3 + 9x^2 - 5x - 11x^2 - 99x + 55 = x^3 - 2x^2 - 104x + 55$ B

27. $(5x-11y)^2$

$(5x)^2 - 2(5x)(11y) + (11y)^2$

$5x^2 - 110xy + 121y^2$ B

28. $(9x+5y)(9x-5y)$

$(9x)^2 - (5y)^2$

$81x^2 - 25y^2$ C

29. WE DIDN'T GO INTO DETAIL ABOUT SYNTHETIC DIVISION SO WE WILL USE LONG DIVISION:

$(6R^3 - 40R^2 - 11R - 21) \div (R-7)$

$6R^2 + 2R + 3$ ← QUOTIENT D

$R-7 \overline{)\ 6R3 - 40R^2 - 11R - 21}$

$6R3 - 42R^2$

$2R^2 - 11R$

$2R^2 - 14R$

$3R - 21$

$3R - 21$

0 ← REMAINDER

30. $x^3 + 2x^2 + 3x + 6$

$x^3 + 3x + 2x^2 + 6$ FACTOR BY GROUPING

$x(x^2+3) + 2(x^2+3)$

$(x+2)(x^2+3)$ D

31. $125x^3 - y^3$

$(5x)^3 - y^3$ DIFFERENCE OF TWO CUBES

$(5x-y)((5x)^2 + (5x)y + y^2)$

$(5x-y)(25x^2 + 5xy + y^2)$ D

32. $x^4 - 24x^2 - 25$

$(x^2)^2 - 24(x^2) - 25$

DIFFERENCE OF TWO SQUARES $(x^2 - 25)(x^2 + 1)$

$(x+5)(x-5)(x^2+1)$ D

33. $6x - 3y = 12$ ← LINE #1

$y = 2x - 5$ ← LINE #2 ← SLOPE IS 2

$6x - 3y = 12$

$-3y = -6x + 12$

$y = \frac{-6}{-3}x + \frac{12}{-3} = 2x - 4$

LINE #1 SLOPE IS ALSO 2 SO THE LINES ARE PARALLEL A

34. IGNORE THIS PROBLEM!

$f(x) = 3x^2 + 6 \quad g(x) = x + 7$ FIND $f(1) - g(1)$

$f(1) = 3(1)^2 + 6 = 9$

$g(1) = 1 + 7 = 8$

$f(1) - g(1) = 9 - 8 = 1$ [D]

35. $x^2 - 9 = 8x$

$x^2 - 8x - 9 = 0$

$(x-9)(x+1) = 0 \qquad x = -1, 9$ B

36. THE DOMAIN IS DETERMINED BY THE DENOMINATOR. IF A VALUE OF X WOULD RESULT IN A 0 DENOM., THEN THAT VALUE IS EXCLUDED FROM THE DOMAIN.

36. (CONT.) THIS DENOM. IS $3x^2+6x-45$

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

$= 3(x+5)(x-3)$

SO X CAN BE ANY REAL NUMBER EXCEPT -5 & $+3$. D

37. $\frac{x^2+8x+16}{x^2+9x+20} \cdot \frac{x^2+5x}{x^2-3x-28}$

$= \frac{(x+4)(x+4)}{(x+4)(x+5)} \cdot \frac{x(x+5)}{(x-7)(x+4)} = \frac{x}{x-7}$ B

38. $\frac{x^2-6x+9}{8x-24} \div \frac{12x-36}{96}$

$\frac{(x-3)(x-3)}{8(x-3)} \cdot \frac{96}{12(x-3)} = \frac{96}{8 \cdot 12} = \frac{96}{96} = 1$ D

39. $\frac{x}{x^2-25} + \frac{5}{x+5} = \frac{6}{x}$

$\frac{x}{(x+5)(x-5)} + \frac{5}{(x+5)} = \frac{6}{x}$ LCD $= x(x+5)(x-5)$

$\frac{x}{x} \cdot \frac{x}{(x+5)(x-5)} + \frac{x(x-5)}{x(x-5)} \cdot \frac{5}{(x+5)} = \frac{(x+5)(x-5)}{(x+5)(x-5)} \cdot \frac{6}{x}$

$\frac{x^2+5x^2-25x-6x^2+150}{x(x-5)(x+5)}$

$\frac{-25x+150}{x(x-5)(x+5)}$

$\frac{-25(x+6)}{x(x-5)(x+5)}$ A

40. $\dfrac{4+\frac{2}{x}}{\frac{x}{4}+\frac{1}{8}}$ $\quad LCD = 8x$

$$= \frac{4\cdot(8x)+\frac{2}{x}(8x)}{\frac{x}{4}(8x)+\frac{1}{8}(8x)}$$

$$= \frac{32x+16}{2x^2+x} = \frac{16(2x+1)}{x(2x+1)} = \frac{16}{x} \qquad D$$

41. $\frac{1}{x}+\frac{1}{x+6}=\frac{x+7}{x+6}$ $\quad LCD = x(x+6)$

$$\frac{x+6}{x(x+6)}+\frac{x}{x(x+6)}=\frac{x(x+7)}{x(x+6)}$$

$$x+6+x = x(x+7)$$

$$2x+6 = x^2+7x$$

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

$$x^2+5x-6=0$$

$$(x+6)(x-1)=0$$

WHEN CHECKING THESE 2 SOLUTIONS, WE SEE THAT $x=-6$ WOULD RESULT IN A DIVISION BY 0 SO IT IS A FALSE SOLUTION. ONLY $x=1$ CHECKS

$x = \cancel{-6}, 1$ $\qquad B$

42. $\sqrt[3]{5x^8y^4}$

$(5x^8y^9)^{1/3}$ $\qquad A$

43. $\sqrt[4]{x^{20}}$

$(x^{20})^{1/4} = x^{\frac{20}{4}} = x^5$ $\qquad D$

44. $243^{\frac{4}{5}}$

$(243^{1/5})^4 = (\sqrt[5]{243})^4 = 3^4 = 81$ C

45. $\sqrt{3a} - 5\sqrt{108a} + 3\sqrt{75a}$

$= \sqrt{3a} - 5\sqrt{36}\sqrt{3a} + 3\sqrt{25}\sqrt{3a}$

$= \sqrt{3a} - 5 \cdot 6\sqrt{3a} + 3 \cdot 5\sqrt{3a}$

$= \sqrt{3a} - 30\sqrt{3a} + 15\sqrt{3a}$

$= (1 - 30 + 15)\sqrt{3a} = -14\sqrt{3a}$ D

46. $\frac{7}{\sqrt{5}+2}$

$= \frac{7}{(\sqrt{5}+2)} \cdot \frac{(\sqrt{5}-2)}{(\sqrt{5}-2)} = \frac{7\sqrt{5} - 14}{(\sqrt{5})^2 - 2^2}$

$= \frac{7\sqrt{5} - 14}{5 - 4} = \frac{7\sqrt{5} - 14}{1}$

$= 7\sqrt{5} - 14$ B

47. $\sqrt{6x-5} = 5$

$(\sqrt{6x-5})^2 = 5^2$

$6x - 5 = 25$

$6x = 30$

$x = 5$ A

48. $(9+4i) - (-3+i)$

$9 + 4i + 3 - i$

$12 + 3i$ D

49. $4x^2 = -6x - 1$

$4x^2 + 6x + 1 = 0$

$a = 4 \quad b = 6 \quad c = 1$

$$x = \frac{-6 \pm \sqrt{6^2 - 4 \cdot 4 \cdot 1}}{2 \cdot 4} = \frac{-6 \pm \sqrt{36 - 16}}{8}$$

$$= \frac{-6 \pm \sqrt{20}}{8} = \frac{-6 \pm \sqrt{4}\sqrt{5}}{8}$$

$$= \frac{-6 \pm 2\sqrt{5}}{8} = \frac{2(-3 \pm \sqrt{5})}{2 \cdot 4} = \frac{-3 \pm \sqrt{5}}{4}$$ C.

50. $5^2 = 25$

$\text{Log}_5 25 = 2$ C

51. $\frac{x-9}{3} = \frac{x+3}{9}$

$9(x-9) = 3(x+3)$

$9x - 81 = 3x + 9$

$6x = 90$

$x = 15$ B

52. $\frac{1}{P} + \frac{1}{Q} = \frac{1}{F}$ SOLVE FOR Q

$LCD = P \cdot Q \cdot F \qquad PQF\frac{1}{P} + PQF\frac{1}{Q} = PQF\frac{1}{F}$

$QF + PF = PQ$

$QF - PQ = -PF$

$Q(F - P) = -PF$

$$Q = \frac{-PF}{(F-P)}$$ C.