

MTH 28, Midterm 2, V. 4, 10/23/24

Prof. Luis Fernández

NAME: _____ SOLUTION _____

There are 19 questions. Some are multiple choice and some are free response.
Each question is worth 6 points over 100 (so 14 points are extra credit).
For multiple-choice questions, just circle your answer.
For free-response questions, SHOW ALL WORK to receive credit.

1. Add and simplify.

$$\frac{x-1}{x+4} + \frac{x+3}{x+2}$$

Solution:

$$\frac{2x^2 + 8x + 10}{(x+4)(x+2)}$$

2. Simplify the rational expression.

$$\frac{x^2 - 2x - 8}{x - 4}$$

Solution:

$$x + 2$$

3. Simplify the expression

$$\frac{x^2 - 4}{x^2 - 3x + 2}$$

Solution:

$$\frac{x+2}{x-1}$$

4. Multiply and simplify your answer.

$$\frac{x-4}{x} \cdot \frac{x^2+3x}{x^2-x-12}$$

Solution:

$$1$$

5. Multiply and simplify

$$\frac{x^2 - x - 30}{x^2 - 10x + 24} \cdot \frac{x^2 - 16}{x^2 + 8x + 16}$$

Solution:

$$\boxed{\frac{x + 5}{x + 4}}$$

6. Divide and simplify your answer.

$$\frac{x^2 + 7x}{10} \div \frac{x + 7}{2}$$

Solution:

$$\boxed{\frac{x}{5}}$$

7. Divide and simplify your answer.

$$\frac{x^2 - 25}{x^2 - 11x + 30} \div \frac{x}{x - 6}$$

Solution:

$$\boxed{\frac{x + 5}{x}}$$

8. Multiply and simplify your answer.

$$\frac{x^2 - 4}{x^2 - 3x + 2} \cdot \frac{x - 1}{x}$$

Solution:

$$\boxed{\frac{x + 2}{x}}$$

9. Add and simplify

$$\frac{5}{x^2} + \frac{2}{x^2 + x}$$

Solution:

$$\boxed{\frac{7x + 5}{x^2(x + 1)}}$$

10. Add and simplify

$$\frac{5}{y - 3} + \frac{3}{y + 5}$$

Solution:

$$\boxed{\frac{8y + 16}{(y - 3)(y + 5)} \text{ or } \frac{8(y + 2)}{(y - 3)(y + 5)}}$$

11. Match the expressions below with the letters labeling their equivalent expressions.

\boxed{A} 1. $\frac{1}{x - 3} + \frac{1}{x^2 - 9}$

\boxed{C} 2. $\frac{1}{x + 3} + \frac{1}{x^2 + 9}$

\boxed{B} 3. $\frac{1}{x - 3} + \frac{1}{x^2 + 9}$

A. $\frac{x + 4}{x^2 - 9}$

B. $\frac{x^2 + x + 6}{(x - 3)(x^2 + 9)}$

C. $\frac{x^2 + x + 12}{(x + 3)(x^2 + 9)}$

Solution:

$$\boxed{\frac{1}{(x + 3)(x + 4)}}$$

12. Subtract and simplify

$$\frac{1}{x + 3} - \frac{1}{x + 4}$$

Solution:

$$\boxed{\frac{1}{(x + 3)(x + 4)}}$$

13. Simplify the expression

$$\frac{1 + \frac{4}{c-4}}{1 - \frac{4}{c-4}}$$

Solution:

$$\boxed{\frac{c}{c-8}}$$

14. Simplify the expression

$$\frac{\frac{x^3}{x-7}}{\frac{x^7}{x^2-2x-35}}$$

Solution:

$$\boxed{\frac{x+5}{x^4}}$$

15. Subtract and simplify

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

Solution:

$$\boxed{\frac{x-4}{(x-1)(x+4)}}$$

16. Solve the following equation:

$$x + \frac{1}{x} = 2$$

Solution: $x = 1$.

17. Solve the equation: $\frac{x}{4x - 12} - \frac{x - 4}{x - 3} = 1$.

Solution: $x = 4$.

18. Solve the following equation:

$$\frac{x+1}{x-1} = \frac{-10}{x+3} + \frac{8}{x^2+2x-3}$$

Solution: $x = -15$. Note that $x = 1$ is not a solution.

19. Solve the following equation:

$$\frac{4}{x^2-25} + \frac{3}{x-5} = \frac{2}{x+5}$$

Solution: $x = -29$.