

MTH 28, Midterm 2, V. 1, 10/29/25

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. Simplify the expression

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

Solution:

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

2. Simplify the rational expression.

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

Solution:

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

3. Multiply and simplify your answer.

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

Solution:

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

4. Multiply and simplify your answer.

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

Solution:

$$\boxed{1}$$

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. Add and simplify.

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

Solution:

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

9. Add and simplify

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

Solution:

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

10. Add and simplify

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

Solution:

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

11. Subtract and simplify

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

Solution:

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

12. Subtract and simplify

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

Solution:

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

- 13.** Match the expressions below with the letters labeling their equivalent expressions.

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

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

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:

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

- 15.** 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:

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

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

Solution: $\boxed{x = 4}.$

17. Solve the following equation:

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

Solution: $\boxed{x = -29}.$

18. Solve the following equation:

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

Solution: $x = 1$.

19. 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.