

NAME: _____ SOLUTION _____

There are 22 questions. Some are multiple choice and some are free response.
Each question is worth 5 points over 100 for a total of 110 (so 10 points are extra credit).
For multiple-choice questions, just circle your answer.
For free-response questions, SHOW ALL WORK to receive credit.
No electronics or notes allowed except a 4-function calculator (permitted but not needed).

1. Factor completely:

$$4x^2 - 9$$

Solution: $(2x + 3)(2x - 3)$

2. Factor completely: $45x^2y - 20y^3$

Circle the answer.

Solution:

(a) $5(9x^2y - 4y^3)$

(b) $5y(9x^2 - 4y^2)$

(c) $5y(3x - 2y)(3x + 2y)$

(d) $5y(3x - 2y)^2$

3. Solve the equation

$$n^2 + 8n + 7 = 0.$$

Solution: -1 and -7 .

4. Factor completely:

$$x^2 - x - 6$$

Solution: $(x - 3)(x + 2)$

5. Factor completely:

$$8x^2 - 2x - 1$$

Solution: $(2x - 1)(4x + 1)$

6. Factor completely: $6x^4 - 9x^3$

Solution: $3x^3(2x - 3)$

7. Factor completely:

$$y^2 - 7y + 4y - 28$$

Solution: $(y + 4)(y - 7)$.

8. Factor completely:

$$25x^2y^4 + 10xy - 15x$$

Solution: $5x(5xy^4 + 2y - 3)$

9. Solve the equation

$$7z - z^2 = 0.$$

Solution: 0 and 7.

10. Given the function $f(x) = 3x^2 + 5x - 2$, calculate the following values:

Solution:

- $f(0) =$ -2

- $f(2) =$ 20

- $f(-2) =$ 0

- $f(x+1) =$ $3(x+1)^2 + 5(x+1) - 2$

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

11. Solve the equation

$$3w^3 - 27w^2 + 54w = 0.$$

Solution:

$w = 0, w = 3, w = 6.$

12. Solve the equation

$$x(x - 18) = -72.$$

Solution:

$x = 6, x = 12$

- 13.** Simplify the expression

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

Solution:

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

- 14.** Simplify the rational expression.

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

Solution:

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

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

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

16. Simplify the expression

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

Solution:

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

17. Subtract and simplify

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

Solution:

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

18. Add and simplify.

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

Solution:

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

- 19.** Divide and simplify your answer.

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

Solution:

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

- 20.** Multiply and simplify

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

Solution:

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

21. Solve the following equation:

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

Solution: $x = 1$.

22. 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.