MTH 28, Midterm 1, V. 4, 09/25/24 Prof. Luis Fernández

NAME: SOLUTION

There are 18 questions. Some are multiple choice and some are free response.
Each question is worth 6 points over 100 for a total of 108 (so 8 points are extra credit).
For multiple-choice questions, just circle your answer.
For free-response questions, SHOW ALL WORK to receive credit.

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

Circle the answer.

Solution:

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

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

(c) $5\left(9x^2y - 4y^3\right)$

(d) $5y\left(9x^2 - 1024y^2\right)$

2. Factor by grouping:
$y^2 - 7y + 4y - 28$

Solution: $\boxed{(y + 4)(y - 7)}$.

3. Factor out the greatest common factor (GCF).
$6x^4 - 9x^3$

Solution: $\boxed{3x^3(2x - 3)}$

4. Factor:
$x^2 - x - 6$

Solution: $\boxed{(x - 3)(x + 2)}$

5. Factor:

$x^2 + 8x + 15$

Solution: $\boxed{(x+5)(x+3)}$.

6. Factor:

$8x^2 - 2x - 1$

Solution: $\boxed{(2x-1)(4x+1)}$

7. Factor the difference of squares:

$4x^2 - 9$

Solution: $\boxed{(2x+3)(2x-3)}$

8. Factor out the greatest common factor (GCF).

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

Solution: $\boxed{5x(5xy^4 + 2y - 3)}$

9. Solve the equation
$n^2 + 8n + 7 = 0$.

Solution: $\boxed{-1 \text{ and } -7}$.

10. Factor completely: $30x^2y + 5xy - 60y$

Circle the answer.

Solution:

(a) $5y\big(6x^2 + x - 12\big)$

(b) $y\big(30x^2 + 5x - 60\big)$

(c) $5y(3x - 4)(2x + 3)$

(d) $xy(15x + 65)$

11. For the polynomial $x^2 + x^5 - 3x - 5$,

a) Determine the coefficient and the degree of each term.

Solution:

Term	Coefficient	Degree
x^2	1	2
x^5	1	5
$-3x$	-3	1
-5	-5	0

b)
The degree of the polynomial is $\boxed{5}$,

The leading term is $\boxed{x^5}$,

The leading coefficient is $\boxed{1}$.

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

- $f(0) = \boxed{-2}$
- $f(2) = \boxed{20}$
- $f(-2) = \boxed{0}$
- $f(x+1) = \boxed{3(x+1)^2 + 5(x+1) - 2}$
- $f(-x) = \boxed{3x^2 - 5x - 2}$

13. Evaluate the function $g(x) = -4$ at the given values:

Solution:

- $g(0) = \boxed{-4}$
- $g(2) = \boxed{-4}$
- $g(-5) = \boxed{-4}$
- $g(x+1) = \boxed{-4}$

14. Find all real number solutions for the equation

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

Solution:

$x = 6$, $x = 12$

15. Solve the equation

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

Solution:

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

16. Solve the equation: $6x^2 + 3 = 11x$.

Solution:

$x = \frac{3}{2}$, $x = \frac{1}{3}$

17. Let $f(x) = \dfrac{x+7}{3x-3}$.

Compute the following values.
If one is not defined, type *Undefined.*
Solution:

- $f(0) = \boxed{-\dfrac{7}{3}}$
- $f(2) = \boxed{3}$
- $f(1) = \boxed{\text{Undefined}}$

18. Solve the equation

$7z - z^2 = 0.$

Solution: $\boxed{0 \text{ and } 7}$.