Math 40 – Intermediate Algebra – Chapter 5 Lab

In problems 1 – 4 expand the product by multiplying and combining like terms:

1. $\frac{2}{5}ab\left(\frac{3}{4}a^4b - \frac{7}{4}ab^3 + 10ab\right)$

2. $(5a + 2b)(a - 6b)$

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

4. $(a^3 + 9b)(a^3 - 9b)$

5. Expand the square and combine like terms: $[6a + (b - 3)]^2$.

6. Write as a sum of simplified ratios: $\dfrac{2y^3 + 8y}{6y^2}$

7. Divide $\dfrac{x^3 + 4x^2 - 3x - 12}{x^2 - 3}$ using long division and then relate dividend, divisor, quotient and

   remainder in an equation $\dfrac{x^3 + 4x^2 - 3x - 12}{x^2 - 3} = ?$

8. Divide $\dfrac{3w^4 + 16w^3 + 37w^2 + 38w - 16}{w^2 + 3w + 6}$ using long division and then relate dividend, divisor,

   quotient and remainder in an equation $\dfrac{3w^4 + 16w^3 + 37w^2 + 38w - 16}{w^2 + 3w + 6} = ?$

9. Suppose $f(x) = 3x^3 + 10x^2 - 4x - 35$ and $g(x) = 3x - 5$ find

   a. $\dfrac{f}{g}(x)$ b. $\dfrac{f}{g}(3)$

10. The area of the parallelogram pictured to the right is
    $7x^2 + 22x + 16$ square meters.
    If its base is $(7x + 8)$ meters, find its height.

(7x+8)meters
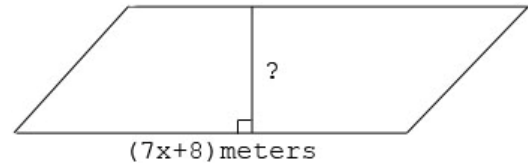
11. Factor out the greatest common factor: $4c(8c + 7) + 7(8c + 7)$

12. Factor completely: $4y^2 + 7y - 20y - 35$

13. Factor and then check your answer by multiplication: $x^2 + 13xy + 42y^2$.

In 14 – 25, Factor the trinomial completely. If it cannot be factored, say it is prime.

14. $3x^2 + 13xy - 10y^2$

15. $-3x^3 - 21x^2 - 36x$

16. $3(x - 6)^2 + 13(x - 6) + 12$

17. $x^2 - 8x - 12$

18. $z^4 - 6z^2 + 9$

19. $27p^2r - 75b^2r$

20. $(6y + 1)^3 + 64y^3$

21. $64x^2 - y^2$.

22. $7x^4 - 189xy^3$.

23. $9x^4 - 25$

24. $v^2 - 2v + 1 - 9p^2$.

25. $2a - 18a^3$.

26. Solve the equation: $2x^3 + 17x^2 = 9x$

27. Solve the equation: $-8x^3 - 20x^2 = 8x$

28. Find the zeros of the function $s(d) = 3d^3 - 18d^2 - 21d$. What are the intercepts of the graph
    of the function?

29. Solve the equation $(x - 5)(x - 6) = 2$

30. The marginal cost C (in dollars) to produce x bicycles is $C(x) = x^2 - 32x + 470$.

   a. Find the marginal cost of producing 30 bicycles.
   b. How many bicycles can be manufactured so that marginal cost equals $214?
   c. Economic theory states that, to maximize profit, production should continue until marginal
      revue equals marginal cost. Assuming that marginal revenue equals $230, how many
      bicycles should be manufactured?

In problems 1 – 3 expand the product by multiplying and combining like terms:

1. $\dfrac{3}{4}a^2 p\left(\dfrac{2}{9}a^3 p - \dfrac{8}{3}a^2 p^2 + 10ap\right)$

2. $\left(\dfrac{5}{3}a + 6b\right)(a - 9b)$

3. $(x + y + 1)(x - y + 1)$

4. Expand the square and combine like terms: $\left[a^2 + (6a - 9)\right]^2$.

5. Write as a sum of simplified ratios: $\dfrac{12x^2 + 20x^5}{15x^4}$

6. Divide $\dfrac{6x^3 - 4x^2 - 3x + 2}{2x^2 - 1}$ using long division and then relate dividend, divisor, quotient and

   remainder in an equation $\dfrac{6x^3 - 4x^2 - 3x + 2}{2x^2 - 1} = ?$

7. Divide $\dfrac{x^4 - 4x^3 + 14x^2 + x + 100}{x^2 - 5x + 11}$ using long division and then relate dividend, divisor, quotient

   and remainder in an equation $\dfrac{x^4 - 4x^3 + 14x^2 + x + 100}{x^2 - 5x + 11} = ?$

8. The area of the parallelogram pictured to
   the right is $8x^2 + 49x + 45$ square meters.
   If its base is $(x + 5)$ meters, find its height.

(x+5) meters
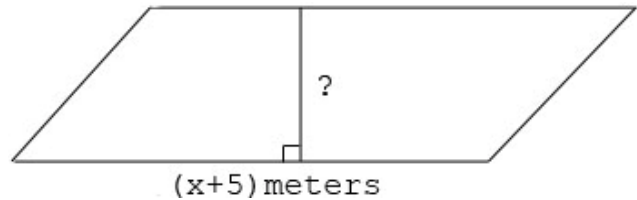
9. Factor completely: $88A^2 - 40AB - 99AB + 45B^2$

In 10 – 14, Factor the trinomial completely. If it cannot be factored, say it is prime.

10. $8x^2 + 30x + 27$ 12. $8x^2 - 18y^2$.   14. $(3a + 2)^3 - 27a^3$

11. $-2x^3 - 8x^2 - 154x$ 13. $5(a - 10)^2 + 16(a - 10) + 12$

15. Find all solutions to the equation: $8x^3 + 15x = 22x^2$

16. Find the zeros of the function $f(x) = 3x^3 - 10x^2 + 8x$.
   What are the intercepts of the graph of the function?

17. Find all solutions to the equation: $(2x - 3)(x - 4) = 7$

18. The marginal cost C (in dollars) to produce x solar panels is $C(x) = 2x^2 - 15x + 700$.
   a. Find the marginal cost of producing 10 solar panels.
   b. How many solar panels can be manufactured so that marginal cost equals $693?

Math 40 – Intermediate Algebra – Chapter 5 Test Solutions

1. $\dfrac{3}{4}a^2 p\left(\dfrac{2}{9}a^3 p - \dfrac{8}{3}a^2 p^2 + 10ap\right) = \dfrac{1}{6}a^5 p^2 - 2a^4 p^3 + \dfrac{15}{2}a^3 p^2$

2. $\left(\dfrac{5}{3}a + 6b\right)(a - 9b) = \dfrac{5}{3}a^2 - 15ab + 6ab - 54b^2 = \boxed{\dfrac{5}{3}a^2 - 9ab - 54b^2}$

3. $(x + y + 1)(x - y + 1) = x(x - y + 1) + y(x - y + 1) + (x - y + 1)$
$$= x^2 - xy + x + xy - y^2 + y + x - y + 1 = \boxed{x^2 - y^2 + 2x + 1}$$

4. Expand the square and combine like terms:
$$\left[a^2 + (6a - 9)\right]^2 = \left(a^2\right)^2 + 2a^2(6a - 9) + (6a - 9)^2$$
$$= a^4 + 12a^3 - 18a^2 + 36a^2 - 108a + 81 = \boxed{a^4 + 12a^3 + 18a^2 - 108a + 81}$$

5. Write as a sum of simplified ratios: $\dfrac{12x^2 + 20x^5}{15x^4} = \dfrac{4}{5x^2} + \dfrac{4x}{3}$

6. Divide $\dfrac{x^4 - 4x^3 + 14x^2 + x + 100}{x^2 - 5x + 11}$ using long
   division and then relate dividend, divisor, quotient
   and remainder in an equation
   $$\dfrac{x^4 - 4x^3 + 14x^2 + x + 100}{x^2 - 5x + 11} = x^2 + x + 8 + \dfrac{30x - 88}{x^2 - 5x + 11}$$

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                           x2 +  x +  8
   x² - 5x +11 | x⁴ -  4x³ +14x² +  x +100
                -(x⁴ -  5x³ +11x²)
                       x³ +  3x²     +  x
                     -(x³ -  5x²  + 11x)
                             8x²  - 10x + 100
                            -(8x² - 40x +  88)
                                    30x +  12
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7. The area of the parallelogram pictured to the right is
   $8x^2 + 49x + 45$ square meters.
   If its base is $(x + 5)$ meters, then since
   $8x^2 + 49x + 45 = (x + 5)(8x + 9)$, the height is $8x + 9$

   ?

   (x+5) meters
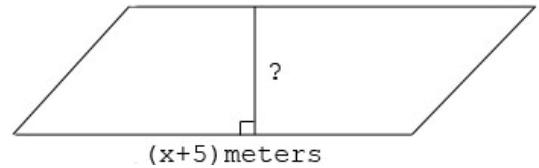
8. Factor completely:
   $88A^2 - 40AB - 99AB + 45B^2 = 8A(11A - 5B) - 9B(11A - 5B) = (8A - 9B)(11A - 5B)$

9. $8x^2 + 30x + 27 = (4x + 9)(2x + 3)$

10. $-2x^3 - 8x^2 - 154x = -2x(x^2 + 4x + 77)$

11. $8x^2 - 18y^2 =$
    $2(2x - 3y)(2x + 3y)$

12. $5(a - 10)^2 + 16(a - 10) + 12$
    $= (5a - 44)(a - 8)$

13. $(3a + 2)^3 - (3a)^3$
    $= 2(27a^2 + 18a + 4)$

14. Find all solutions to the equation: $8x^3 + 15x = 22x^2$
    $x(8x^2 - 22x + 15) = x(2x - 3)(4x - 5) = 0 \Leftrightarrow x = 0$ or $x = 3/2$ or $x = 5/4$

15. Find the zeros of the function $f(x) = 3x^3 - 10x^2 + 8x = x(3x - 4)(x - 2) = 0$ if $x = 0$, 4/3 or 2

16. Find all solutions to the equation:
    $(2x - 3)(x - 4) = 7 \Leftrightarrow 2x^2 - 11x + 5 = (2x - 1)(x - 5) = 0 \Leftrightarrow x = 1/2$ or $x = 5$

17. The marginal cost C (in dollars) to produce x solar panels is $C(x) = 2x^2 - 15x + 700$.

    a. The marginal cost of producing 10 solar panels is $C(10) = 200 - 150 + 700 = \$750$

    b. $2x^2 - 15x + 700 = 693 \Leftrightarrow 2x^2 - 15x + 7 = (2x - 1)(x - 7) = 0 \Rightarrow x = 7$ solar panels\