LESSON 166

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

2. The answer is B.
$(x + 2)(x - 4) = x^2 - 4x + 2x - 8 = x^2 - 2x - 8$

A) $(x - 1)^2 - 8 = x^2 - 2x + 1 - 8 = x^2 - 2x - 7$
B) $(x - 1)^2 - 9 = x^2 - 2x + 1 - 9 = x^2 - 2x - 8$
C) $(x + 1)^2 - 8 = x^2 + 2x + 1 - 8 = x^2 + 2x - 7$
B) $(x + 1)^2 - 9 = x^2 + 2x + 1 - 9 = x^2 + 2x - 8$

3. $(x^2 - 5x + 4)(x + 2)$
$= x^3 + 2x^2 - 5x^2 - 10x + 4x + 8$
$= x^3 - 3x^2 - 6x + 8$

$a + b + c + d = 1 + (-3) + (-6) + 8 = 0$

4. Use the ac method: $ac = 2(3) = 6, b = 7$.
1 and 6 are factors of 6 whose sum is 7.

$2x^2 + 7x + 3$	
$= 2x^2 + x + 6x + 3$	Break up $7x$.
$= x(2x + 1) + 3(2x + 1)$	Factor by grouping.
$= (2x + 1)(x + 3)$	

5. The answer is D.

$3x - 4 + x(1 - x)$	
$= 3x - 4 + x - x^2$	Distributive property
$= -x^2 + 4x - 4$	Simplify.
$= -(x^2 - 4x + 4)$	Factor out -1.
$= -(x - 2)^2$	Perfect square trinomial

6. The answer is C.

$x^4 - 16$	
$= (x^2 + 4)(x^2 - 4)$	Difference of squares
$= (x^2 + 4)(x + 2)(x - 2)$	Difference of squares

7.
$$\begin{array}{r|l} & 2x\ -1 \\ \hline 2x+1 & 4x^2 + 0x - 9 \\ & 4x^2 + 2x \\ \hline & -2x - 9 \\ & -2x - 1 \\ \hline & -8 \end{array}$$

Quotient $= 2x - 1$
Remainder $= -8$
$a = -1, b = -8$
$ab = (-1)(-8) = 8$

8. You can use long division or synthetic division.

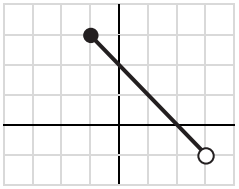
$$\begin{array}{r|cccc} 2 & 3 & -2 & -7 & 4 \\ & & 6 & 8 & 2 \\ \hline & 3 & 4 & 1 & 6 \end{array}$$

The quotient is $3x^2 + 4x + 1$. The remainder is 6.

9. Let $p(x)$ be the given polynomial. If $p(x)$ is divisible by $(x + 1)$, then the remainder $p(-1)$ must be zero.
$p(-1) = -k - 7 = 0$
$k = -7$

10. The answer is B.
By the Factor Theorem, if $(x + 5)$ is a factor of $p(x)$, then $p(-5) = 0$.

11. The answer is B.
Each input must have one output.

12. 
$f(-1) = 3$
$f(3) = -1$
The range is $-1 < y \leq 3$, or $(-1, 3]$ in interval notation.

13. Use $f(1) = 4$ to find k.
$f(1) = k + 2 = 4$
$k = 2$

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

14. $f(x - 2) = (x - 2)^2 + 3(x - 2)$
$= x^2 - 4x + 4 + 3x - 6$
$= x^2 - x - 2$

15. $(f/g)(x)$ is undefined when the denominator $g(x)$ is zero. $g(x)$ is zero when $x = 7$. Therefore, $(f/g)(x)$ is undefined for $x = 7$.

16. The answer is B.
See the graphs in Lesson 40.

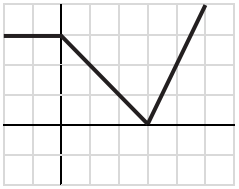
17. The answer is C.

$y = 3f(x)$	Stretch vertically by 3.
$y = -3f(x)$	Reflect over the x-axis.
$g(x) = -3f(x) + 2$	Shift up 2 units.

18. $\dfrac{f(5) - f(0)}{5 - 0} = \dfrac{0 - 5}{5 - 0} = -1$
The average rate of change is -1.

19. $f(-x) = |-x| - 6 = |x| - 6 = f(x)$
The function is even because $f(-x) = f(x)$.

20. $f(1) = -1$
$f^{-1}(1) = 2$ because $f(2) = 1$.
$(f + f^{-1})(1) = f(1) + f^{-1}(1) = -1 + 2 = 1$

21. 
The range is $y \geq 0$, or $[0, \infty)$ in interval notation.

22. Solving $3x - 5 = 1$ gives $x = 2$.
When $x = 2$, $f(1) = 2^2 - 2(2) = 0$.