Algebra 2 Regents Review Packet #1   Key

Polynomials & Expressions:

1. Given $a(x) = -8x^4 - 10x^3 + 17x^2 - 4$ and $b(x) = 4x^2 - 5x + 2$.
   Express $\frac{a(x)}{b(x)}$ in the proper form.

$$\frac{a(x)}{b(x)} = -2x^2 - 5x - 1 + \frac{5x-2}{4x^2-5x+2}$$

$$
\begin{array}{r}
-2x^2 - 5x - 1 \\
4x^2-5x+2 \,\overline{\big)\, -8x^4 - 10x^3 + 17x^2 + 0x - 4} \\
-(-8x^4 + 10x^3 - 4x^2) \\
\hline
-20x^3 + 21x^2 + 0x \\
-(-20x^3 + 25x^2 - 10x) \\
\hline
-4x^2 + 10x - 4 \\
-(-4x^2 + 5x - 2) \\
\hline
5x - 2
\end{array}
$$

2. Perform the given operations and express in standard form: $(x+5)(3x-1) - (x-4)^2$

$$3x^2 + 14x - 5 - (x^2 - 8x + 16)$$

$$3x^2 + 14x - 5$$
$$- x^2 + 8x - 16$$
$$\overline{\boxed{2x^2 + 22x - 21}}$$

3. Use the properties of exponents to rewrite the expression in the form kx^n, where k is a real number, n is an integer, and x is a nonzero real number.

$$\left(\frac{16x^8}{4x^3 \cdot 2x^3}\right)^{-2}$$

$$\left(\frac{16x^8}{8x^6}\right)^{-2}$$

$$\left(2x^2\right)^{-2}$$

$$2^{-2} \cdot x^{-4} = \frac{1}{4x^4} = \boxed{\frac{1}{4}x^{-4}}$$

Exponents & Radicals

4. The expression $\sqrt[3]{27a^{-6}b^3c^2}$ is equivalent to

(1) $\dfrac{3bc^{\frac{2}{3}}}{a^2}$

$3a^{-2}b\sqrt[3]{c^2}$

$\dfrac{3b\sqrt[3]{c^2}}{a^2}$

(2) $\dfrac{3b^9c^6}{a^{18}}$

(3) $\dfrac{3b^6c^5}{a^3}$

$\dfrac{3bc^{\frac{2}{3}}}{a^2}$

(4) $\dfrac{3b\sqrt[3]{3c^2}}{a^2}$

5. The expression $\left(\dfrac{\frac{1}{x^2y}}{x^2y^{-\frac{2}{3}}}\right)^{-6}$ is equivalent to

(1) $\dfrac{y^4}{x^3}$

(3) $\dfrac{1}{x^3y^4}$

(2) $\dfrac{x^3}{y^4}$

(4) x^3y^4

$x^{-3}y^4 = \dfrac{y^4}{x^3}$

6. Given:

$L = \sqrt{2}$

$M = 3\sqrt{3}$

$N = \sqrt{16}$

$P = \sqrt{9}$

Which expression results in a rational number?

1) $L + M$

2) $M + N$

3) $N + P$ $4 + 3 = 7$

4) $P + L$

Factoring

8. If the area of a rectangle is expressed as $x^4 - 9y^2$, then the product of the length and the width of the rectangle could be expressed as

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

$(x^2 + 3y)(x^2 - 3y)$

2) $(x^2 - 3y)(x^2 + 3y)$

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

4) $(x^4 + y)(x - 9y)$

9. Factor completely: $2x^3 - 128y^9$

$2(x^3 - 64y^9)$

10. Factor Completely:

$4x^4 - x^2 + 32x^3 - 8x + 48x^2 - 12$

$x^2(4x^2-1) + 8x(4x^2-1) + 12(4x^2-1)$

$(4x^2-1)(x^2 + 8x^2 + 12)$

$(2x+1)(2x-1)(x+2)(x+6)$

11. Apply the properties of exponents to verify that the given statement $3^{n+2} - 3^n = 8 \cdot 3^n$ is an identity for integer values of n.

$3^{n+2} - 3^n = 8 \cdot 3^n$

$3^n(3^2-1) = 8 \cdot 3^n$

$3^n(9-1) = 8 \cdot 3^n$

$3^n(8) = 8 \cdot 3^n$ ✓

12. Factor completely: $18x^3 + 39x^2 - 24x$

$3x(6x^2 + 13x - 8)$

$3x(2x-1)(3x+8)$

Real vs. Complex

14. Which of the following is equivalent to $-4\sqrt{-48}$ **in simplest radical form?**

(1) $8\sqrt{12}$

(2) $16\sqrt{3}$

(3) $-8i\sqrt{12}$

(4) $-16i\sqrt{3}$

$-4\sqrt{-1 \cdot 16 \cdot 3}$

$-4i \cdot 4\sqrt{3}$

$-16i\sqrt{3}$

15. Evaluate $x^2 - 6x$ **when** $x = 3 - i$.

$(3-i)^2 - 6(3-i)$

$(3-i)(3-i) - 18 + 6i$

$9 - 6i - i^2 - 18 + 6i$

$-9 + 1 = -8$

16. Algebraically determine the values of x and y to correctly complete the identity stated below.

$$3(7 - 2x) - 5(4y - 3)i = x - 2(1 + y)i$$

$21 - 6x - 20yi + 15i = x - 2i - 2yi$

$\underline{-x + 2yi + 2i -x + 2i + 2yi}$

$21 - 7x - 18yi + 17i = 0$

Functions

17. If $f(x) = \dfrac{\sqrt{2x+3}}{6x-5}$, then $f\left(\dfrac{1}{2}\right) =$

$f\left(\tfrac{1}{2}\right) = \dfrac{\sqrt{4}}{-2} = -1$

1) 1

2) -2

3) -1 ⟨circled⟩

4) $\dfrac{13}{3}$

18. The graph of the function $f(x) = \sqrt{x+4}$ is shown below.

Domain: $x \geq -4$

Range: $y \geq 0$
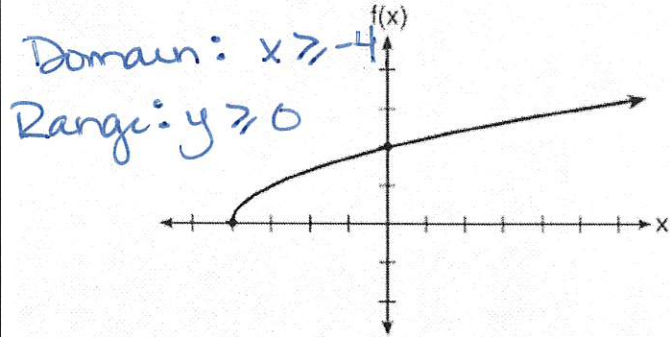
State the domain and range of the function, using interval notation.

19. If $h(x) = \dfrac{1}{2}x + 7$ find $h^{-1}(x)$.

$y = \tfrac{1}{2}x + 7$

$x = \tfrac{1}{2}y + 7$

$x - 7 = \tfrac{1}{2}y$

$\boxed{2x - 14 = h^{-1}(x)}$

20. Which relation is *not* a function?

1) $\{(x,y) : y = |x|\}$

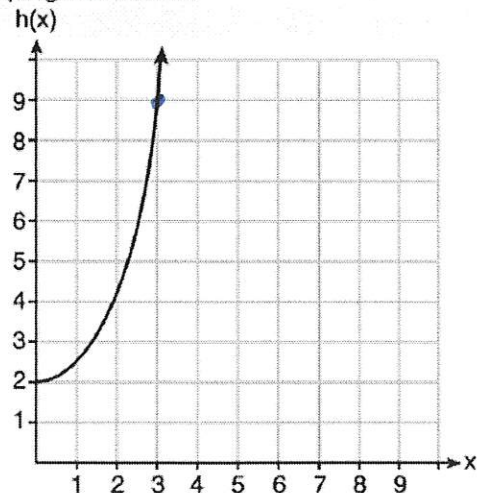2) $\{(x,y) : y = -x^2\}$

3) $\{(x,y) : y = x\}$

4) ⟨circled⟩ $\{(x,y) : y = \pm\sqrt{x}\}$ C

21. Find the average rate of change over the interval $0 \leq x \leq 3$ for the graph given below.

$(0, 2)$
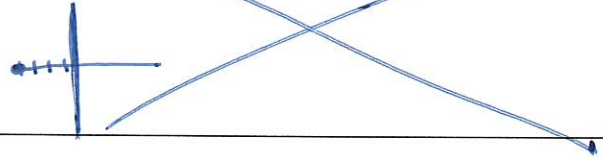
$(3, 9)$

$AROC = \dfrac{9-2}{3-0} = \dfrac{7}{3}$

Linear & Quadratic Functions

$$y = -\left(-\tfrac{1}{6}x + 3\right)^2 + 2$$

22. Write the equation of the function whose parent function is $f(x) = x^2$ and has been translated three units to the left, reflected in both the x and y axes, horizontally scaled by a factor of 6, and translated two units up.	23. Write the equation of a parabola with: Focus: (-4, 0), Directrix: y-axis

24. The graph of $f(x)$ is given below.
   Sketch the graph of $g(x) = f(x-1) - 5$.

Right 1   Down 5