Algebra 2 Benchmark Review #1

- Unit 1: Operations with Polynomials & Complex Numbers
- Unit 2: Quadratic & HOP Equations & Functions
- Unit 3: Functions & Systems

1. Which expression is equivalent to $(2x-i)^2 - (2x-i)(2x+3i)$ where i is the imaginary unit and x is a real number?

1) $-4-8xi$ 3) 2

2) $-4-4xi$ 4) $8x-4i$

$(2x-i)(2x-i)$ $(2x-i)(2x+3i)$

$4x^2-2xi$ $4x^2+6xi$

$-2xi+i^2$ $-2xi-3i^2$

$(4x^2-4xi-1) - (4x^2+4xi+3)$

$4x^2-4xi-1$

$-4x^2-4xi-3$

$-8xi-4$

2. What is the solution set of the equation $\frac{2}{3x+1} = \frac{1}{x} - \frac{6x}{3x+1}$?

$* \; x \neq \frac{-1}{3}$

$x \neq 0$

1) $\left\{-\frac{1}{3}, \frac{1}{2}\right\}$ 3) $\left\{\frac{1}{2}\right\}$

2) $\left\{-\frac{1}{3}\right\}$ 4) $\left\{\frac{1}{3}, -2\right\}$

$\frac{2(x)}{x(3x+1)} = \frac{1(3x+1)-6x(x)}{x(3x+1)}$

$2x = 3x+1-6x^2$

$6x^2-x-1=0$

$x = \frac{1 \pm \sqrt{(-1)^2-4(6)(-1)}}{2(6)}$

$x = \frac{1 \pm \sqrt{25}}{12} = \frac{1 \pm 5}{12}$ $\frac{1+5}{12} = \frac{1}{2}$ $\frac{1-5}{12} = -\frac{1}{3}$

3. Erin and Christa were working on cubing binomials for math homework. Erin believed they could save time with a shortcut. She wrote down the rule below for Christa to follow.

$$(a+b)^3 = a^3 + b^3$$

Does Erin's shortcut always work? Justify your result algebraically.

$(a+b)\boxed{(a+b)(a+b)}$

$\downarrow \; (a^2+ab+ab+b^2)$

$(a+b)(a^2+2ab+b^2)$

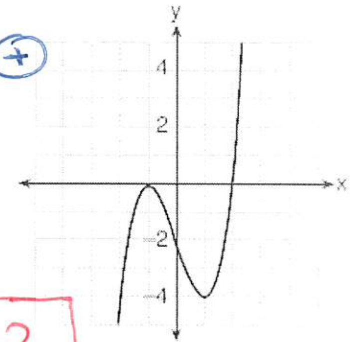
$a^3+2a^2b+ab^2$

$+a^2b+2ab^2+b^3$

$a^3+3a^2b+3ab^2+b^3$

No - Erin's short cut does not always work

4. Write an equation for the function shown in standard form.



a(+)

$x=-1 \quad x=-1 \quad x=2$

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

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

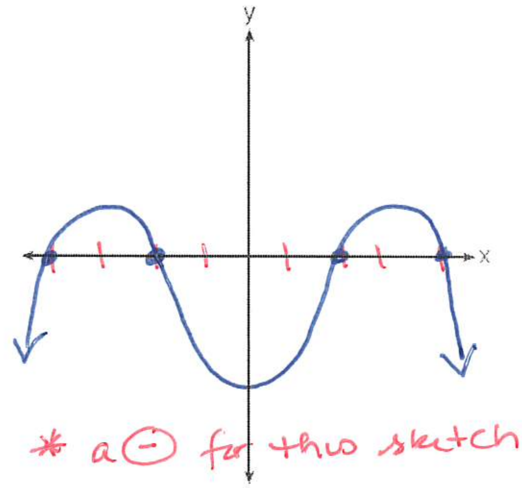
x^3-2x^2

$+2x^2-4x$

$+1x-2$

$\boxed{f(x)=x^3-3x-2}$

5. The zeros of a quartic polynomial function are 2, −2, 4, and −4. Use the zeros to construct a possible sketch of the function, on the set of axes below.



* a(−) for this sketch

6. Given $a(x) = x^4 + 2x^3 + 4x - 10$ and $b(x) = x + 2$, determine $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$. Is $b(x)$ a factor of $a(x)$? Explain.

−2	1	2	0	4	−10
	↓	−2	0	0	−8
	1	0	0	4	−18

$\boxed{1x^3+4-\frac{18}{x+2}}$

No, b(x) is not a factor of a(x) because the remainder ≠ 0

7. Factor the expression $x^3 + 2x^2 - 9x - 18$ completely.

$x^2(x+2)-9(x+2)$

$\boxed{(x^2-9)}(x+2)$

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

8. Solve the given equation algebraically for all values of x. $3\sqrt{x} - 2x = -5$

$$(3\sqrt{x})^2 = (2x-5)^2$$

$$9x = 4x^2 - 20x + 25$$

$$0 = 4x^2 - 29x + 25$$

$$x = \frac{29 \pm \sqrt{(-29)^2 - 4(4)(25)}}{2(4)}$$

$$x = \frac{29 \pm \sqrt{441}}{8}$$

$$x = \frac{29 \pm 21}{8}$$

$$x = \frac{25}{4} \qquad x = 1$$

$$\boxed{\left\{ \frac{25}{4} \right\}}$$

9. Determine the solutions to the equation $5x^2 - 2x + 13 = 9$ in simplest $a + bi$ form.

$$5x^2 - 2x + 4 = 0$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(5)(4)}}{2(5)}$$

$$x = \frac{2 \pm \sqrt{-76}}{10}$$

$$x = \frac{2 \pm 2i\sqrt{19}}{10}$$

$$\boxed{x = \frac{1}{5} \pm \frac{1i}{5}\sqrt{19}}$$

10. Determine the solution to each system of equation:

a. $y = x^2 + 2x + 1$
$y + 4 = x$
$y = \boxed{x-4}$

$$x - 4 = x^2 + 2x + 1$$

$$0 = x^2 + x + 5$$

$$x = \frac{-1 \pm \sqrt{(1)^2 - 4(1)(5)}}{2(1)}$$

$$x = \frac{-1 \pm \sqrt{-19}}{2}$$

* Imaginary – so this system does NOT intersect

b. ~~$y = x^2 + 2x + 1$~~
~~$y - x = 4$~~

$y = x^2 - 4x - 2$
$y - x = -2$
$y = \boxed{x-2}$

$$x - 2 = x^2 - 4x - 2$$

$$0 = x^2 - 5x$$

$$0 = x(x-5)$$

$$x = 0 \qquad x = 5$$

$$y = x - 2 \qquad y = x - 2$$

$$y = 0 - 2 \qquad y = 5 - 2$$

$$y = -2 \qquad y = 3$$

$$\boxed{(0, -2) \qquad (5, 3)}$$