NAME: _____ PERIOD: _____ DATE: _____

Homework Problem Set

Express each of the following in *a* + *bi* form.

1. $(2 + 5i) + (4 + 3i)$

$2+5i+4+3i$

$\boxed{6+8i}$

2. $(-1 + 2i) - (4 - 3i)$

$-1+2i-4+3i$

$\boxed{-5+5i}$

3. $(4 + i) + (2 - i) - (1 - i)$

$4+i+2-i-1+i$

$\boxed{5+i}$

4. $(5 + 3i)(5 - 3i)$

$25-15i+15i-9i^2$

$25-9(-1)$

$25+9$

$\boxed{34}$

5. $(2 - i)(2 + i)$

$4+2i-2i-i^2$

$4-(-1)$

$\boxed{5}$

6. $(1 + i)(2 - 3i) + 3i(1 - i) - i$

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

$2+i-6i^2$

$2+i-6(-1)$

$2+i+6$

$\boxed{8+i}$

Express each of the following in *a* + *bi* form.

7. $(1 + i)^2$

$(1+i)(1+i)$

$1+i+i+i^2$

$1+2i+i^2$

$1+2i+(-1)$

$\boxed{2i}$

8. $(1 + i)^4$

$(1+i)^2(1+i)^2$

$(2i)(2i)$

$4i^2$

$4(-1)$

$\boxed{-4}$

9. $(1 + i)^6$

$(1+i)^4(1+i)^2$

$\boxed{-4}$ $2i$

$\boxed{-8i}$

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

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

$(3-i)(3-i) - 6(3-i)$

$9 - 3i - 3i + i^2 - 18 + 6i$

$9 - 6i - 1 - 18 + 6i$

$9 - 1 - 18 = \boxed{-10}$

11. Evaluate $4x^2 - 12x$ when $x = \frac{3}{2} - \frac{i}{2}$.

$4\left(\frac{3}{2} - \frac{i}{2}\right)^2 - 12\left(\frac{3}{2} - \frac{i}{2}\right)$

$4\left(\frac{3}{2} - \frac{i}{2}\right)\left(\frac{3}{2} - \frac{i}{2}\right) - 18 + 6i$

$4\left(\frac{9}{4} - \frac{3i}{4} - \frac{3i}{4} + \frac{i^2}{4}\right) - 18 + 6i$

$9 - 3i - 3i + i^2 - 18 + 6i$

$9 - 6i - 1 - 18 + 6i = \boxed{-10}$

12. Show by substitution that $\frac{5 - i\sqrt{5}}{5}$ is a solution to $5x^2 - 10x + 6 = 0$.

$5\left(\frac{5-i\sqrt{5}}{5}\right)^2 - 10\left(\frac{5-i\sqrt{5}}{5}\right) + 6 = 0$

$5\left(\frac{5-i\sqrt{5}}{5}\right)\left(\frac{5-i\sqrt{5}}{5}\right) - 2(5 - i\sqrt{5}) + 6 = 0$

$\frac{5}{25}\left(\frac{(5-i\sqrt{5})(5-i\sqrt{5})}{5}\right) - 10 + 2i\sqrt{5} + 6$

$\frac{1}{5}(25 - 10i\sqrt{5} + 5i^2) - 10 + 2i\sqrt{5} + 6$

$5 - 2i\sqrt{5} + i^2 - 10 + 2i\sqrt{5} + 6$

$5 + i^2 - 10 + 6$

$5 - 1 - 10 + 6 = \boxed{0}$

13. Use the fact that $x^4 + 64 = (x^2 - 4x + 8)(x^2 + 4x + 8)$ to explain how you know that the graph of $y = x^4 + 64$ has no x-intercepts. You need not find the solutions.

The discriminant of $x^2 - 4x + 8$ and $x^2 + 4x + 8$ is -16.

Neither equation can be factored without using complex #s. Therefore, these functions have no x-intercepts.