SEW Math HW 3 Due Wednesday August 1st
Please be sure to show all work for full credit.

1. Simplify the following as much as possible. Leave your answers with positive exponents only.

$-8^{\frac{4}{3}} = -(2^3)^{4/3}$
$= -2^4$
$= -16$

$\left(\frac{25}{36}\right)^{-\frac{1}{2}} = \left(\frac{36}{25}\right)^{1/2}$
$= \left(\frac{6^2}{5^2}\right)^{1/2}$
$= \frac{6}{5}$

$\sqrt[3]{\frac{-3x}{375x^4}}$
$= -\sqrt[3]{\frac{3x}{3\cdot 5^3 x^3 \cdot x}}$
$= -\frac{1}{5x}$

$\sqrt{81x^6y^{10}} = \sqrt{9^2 (x^3)^2 (y^5)^2}$
$= 9x^3y^5$

$\sqrt{32x^3y^8} = \sqrt{2^5 x^2 \cdot x (y^4)^2}$
$= 4xy^4\sqrt{2x}$

$\sqrt[3]{24x^9y^{11}}$
$= \sqrt[3]{2^3 \cdot 3 (x^3)^3 (y^3)^3 y^2}$
$= 2x^3y^3\sqrt[3]{3y^2}$

8 points

2. Perform the indicated operation and simplify.

$2x\sqrt{3x} + 5\sqrt{12x^3} - x\sqrt{27x} = 2x\sqrt{3x} + 5\sqrt{2^2 \cdot 3 x^2 \cdot x} - x\sqrt{3^2 \cdot 3x}$
$= 2x\sqrt{3x} + 10x\sqrt{3x} - 3x\sqrt{3x}$
$= 9x\sqrt{3x}$

$(\sqrt{5} + 3\sqrt{10})(2\sqrt{5} - \sqrt{10}) = \sqrt{5}(2\sqrt{5}) - \sqrt{5}\sqrt{10} + 6\sqrt{10}\sqrt{5} - 3(\sqrt{10})^2$
$= 10 + 5\sqrt{50} - 30$
$= -20 + 25\sqrt{2}$

$\sqrt[3]{2x^2y^4} \cdot \sqrt{4xy^2}$
$= \sqrt[6]{(2x^2y^4)^2} \cdot \sqrt[6]{(4xy^2)^3}$
$= \sqrt[6]{4x^4y^8 \cdot 64x^3y^6}$
$= \sqrt[6]{2^8 \cdot x^7 \cdot y^{14}}$
$= 2xy^2\sqrt[6]{2^2xy^2}$

6 points

3. Perform the indicated operation. To begin, rewrite this with fractional exponents. Write your answers back into radical form.

$$\frac{\sqrt{x^3}}{\sqrt[4]{x^3}} = \frac{x^{3/2}}{x^{3/4}} = x^{\frac{3}{2}-\frac{3}{4}}$$

$$= x^{\frac{6-3}{4}}$$

$$= x^{\frac{3}{4}}$$

4 points

4. Solve the following equations. Be sure to check your solutions.

$2\sqrt{5-2x} - x = 0$

$2\sqrt{5-2x} = x$

$4(5-2x) = x^2$

$20 - 8x = x^2$

$x^2 + 8x - 20 = 0$

$(x+10)(x-2) = 0$

$x = -10$ ✗

$2\sqrt{5+20} + 10 = 10 + 10 = 20 \neq 0$

$\boxed{x = 2}$

$2\sqrt{5-4} - 2 = 2 - 2 = 0$ ✓

4 points

5. Simplify and rewrite in $a + bi$ form.

$$\frac{6-\sqrt{-45}}{3} = \frac{6 - i\sqrt{9 \cdot 5}}{3} = \frac{6 - 3i\sqrt{5}}{3} = \frac{3(2 - i\sqrt{5})}{3} = 2 - i\sqrt{5}$$

4 points

6. Multiply the numerator and denominator by the conjugate of the denominator (rationalize the denominator) and write your answer in $a + bi$ form.

$$\frac{3+4i}{1+2i} \cdot \frac{1-2i}{1-2i} = \frac{3 - 6i + 4i - 8i^2}{1+4} = \frac{11 - 2i}{5} = \frac{11}{5} - \frac{2}{5}i$$

4 points

7. Multiply and simplify. Write your answer in $a + bi$ form.

$(2 - 3i)(4 + 5i)$ $= 8 + 10i - 12i - 15i^2$

$= 23 - 2i$

2 points

8. Given the functions below, find the following.

$f(x) = x^2 - 3x$ $\quad g(x) = x + 2$ $\quad h(x) = 2x^3 - 5$

a. Find the composition $f(g(x))$

$f(x+2) = (x+2)^2 - 3(x+2)$

$= x^2 + 4x + 4 - 3x - 6$

$= x^2 + x - 2$

4 points

b. Find $h^{-1}(x)$

$x = 2y^3 - 5$

$2y^3 = x + 5$

$y = \sqrt[3]{\frac{x+5}{2}}$

$h^{-1}(x) = \sqrt[3]{\frac{x+5}{2}}$

9. Given the quadratic function below, please answer the following.

$f(x) = x^2 - 2x - 8$

a. Find the vertex of $f(x)$, and write your answer in point form.

$-\frac{b}{2a} = \frac{2}{2} = 1$

$f(1) = -9$

$(1, -9)$

b. Find the x-intercepts of $f(x)$, and write your answers in point form.

$x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$

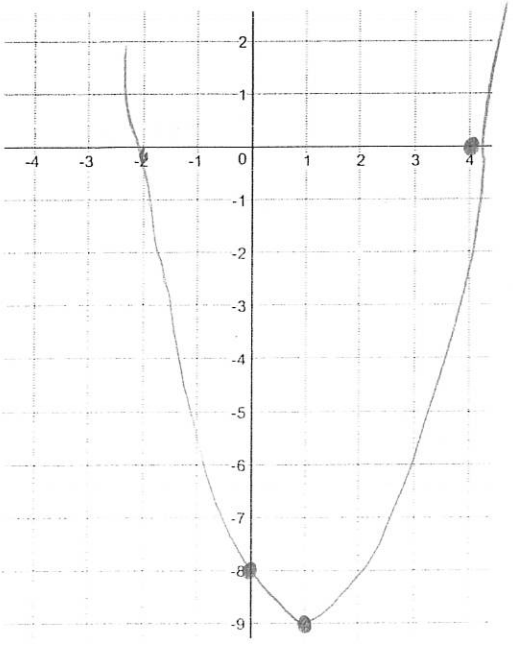
$x = 4, -2$

$(4, 0), (-2, 0)$

c. Find the $y$intercept, and write your answer in point form.

$(0, -8)$

d. Use your answers from parts a - c to sketch a graph of $f(x)$.



6 points