MATH 120
FALL 2013 NAME:
EXAM 1

1. [10 pts.] Given that $p = -5$, $q = 8$, and $r = -10$, evaluate

$$\frac{-(p+2)^2 - 3r}{2 - q}.$$

2. [10 pts. each] Perform the indicated operation.

(a) $(u^3 - 2u^2 + 5) - 2(-7u^3 + 11u^2)$

(b) $x^2\left(3x - \frac{2}{3}\right)\left(5x + \frac{1}{3}\right)$

(c) $(z - 3)^3$

3. [10 pts.] Divide by long division:

$$\frac{30t^3 - 9t^2 + 22t + 5}{5t + 1}$$

4. [10 pts. each] Fully factor each polynomial.

(a) $4t^2 - 12t + 9$

(b) $20p^2 - 100pq + 125q^2$

(c) $k^4 - 625$

(d) $27 + 8\alpha^3$

5. [10 pts. each] Find each product or quotient.

(a) $\dfrac{q^3 + q^2}{7} \cdot \dfrac{49}{q^4 + q^3}$

(b) $\dfrac{x^2 + x - 2}{x^2 + 3x - 4} \div \dfrac{x^2 + 3x + 2}{x^2 + 4x + 3}$

6. [10 pts.] Find the sum: $\dfrac{5}{12x^2y} - \dfrac{7}{6xy^3}$

7. [10 pts.] Simplify the complex fraction:

$$\frac{\frac{1}{\ell} - \frac{1}{\ell + 1}}{\frac{1}{\ell} + \frac{1}{\ell + 1}}$$

8. [10 pts.] Simplify, writing the answer using only positive exponents:

$$\frac{(g^2h^3)^4(gh^4)^{-3}}{g^2h}.$$

9. [10 pts.] Factor $6w^{-2/3} - 5w^{-5/3}$ using the common factor $w^{-5/3}$.

10. [10 pts. each] Simplify each radical expression. Assume variables represent nonzero real numbers (but not necessarily positive numbers).

    (a) $\sqrt[4]{81a^8b^4}$

    (b) $\sqrt[3]{\dfrac{5}{3y}}$

    (c) $\dfrac{\sqrt{2}}{\sqrt{3}-\sqrt{2}}$

11. [10 pts.] Solve the equation: $4[2x - (3 - x) + 5] = -6x - 28$.

12. [10 pts.] Solve for x:

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

13. [15 pts.] A coast guard boat that patrols a river cruises at 30 km/h in still water. The river flows at 6 km/h. For each patrol the captain of the boat must travel upstream and then return. The round trip takes exactly 6 hours. How far upstream does the boat go?

14. [15 pts.] A shylock has loaned a total of $120,000 to two mathematically-challenged fellows named Rudy and Rocko. Part of the money was loaned to Rudy at 22% interest....per week. The rest was loaned to Rocko at 35% interest per week. If the shylock collects $36,150 in interest after the first week, how much money did he loan to Rudy?

15. [10 pts. each] Perform the indicated operation and write the answer in the standard form for complex numbers.

    (a) $(4 - 3i)(2 + 7i)$

    (b) $\dfrac{1-2i}{2+i}$