

Calculators are not allowed. Answers may be left as improper fractions, mixed numbers, or decimals.
Box your final answers. If you need more space, you may continue your work on the back of the page.

1. (6 points) Find the prime factorization of the following numbers.

(a) 54

(b) 36

(c) 81

2. (12 points) Perform the following operations and simplify all answers.

(a) $\left(\frac{1}{36} - \frac{1}{54}\right) \cdot \frac{81}{5} \div \frac{21}{4}$

(b) $\left(108\left(\frac{1}{36} - \frac{1}{81}\right) - 1\right)^2 + \frac{2}{3}$

(c) $\frac{\frac{1}{2} - \frac{1}{6}}{\frac{1}{3} + \frac{1}{4}} + \frac{3}{7}$

3. (6 points) Evaluate each of the following.

(a) 7^{-2}

(b) $\sqrt[3]{-64}$

(c) $8^{5/3}$

4. (12 points) Let $x = 1\frac{1}{3}$, $y = 2\frac{2}{5}$, and $z = -\frac{3}{4}$. Evaluate the following expressions.

(a) $y(b - z^2)$

(b) $\frac{xz}{y - z}$

(c) $\sqrt{3(x - z)}$

5. (4 points) Suppose 10 grapes weigh 3 ounces. How much do 18 grapes weigh?

6. (4 points) The price of a stock increases by 40% to end the day at \$63. What was the price of the stock before the increase?

7. (8 points) Simplify the following expressions and eliminate any negative exponents.

(a) $\sqrt{27} + \sqrt{75}$

(b) $\sqrt{96x^6y^7z^8}$

(c) $\left(\frac{3x^3y^{-2}}{4x^{-3}y^2}\right)^{-2}$

8. (16 points) Simplify the following polynomial expressions.

(a) $(2x^2 + 3x - 2)(3x^2 - 5x - 4)$

(b) $x^2 - (x + 2)(x + 3) - (1 - x)^2$

(c) $\left(x + \frac{1}{2}\right)^3$

(d) $\frac{35p^{10}q^7 - 45p^5q^6 + 20p^8q^9}{5p^2q^3}$

9. (12 points) Factor the following polynomials completely.

(a) $2x^4 - 8x^3 - 64x^2$

(b) $49a^4b^6 - 36x^2y^4$

(c) $25x^2 - 40xy + 16y^2$

10. (8 points) Solve the following linear equations for x .

(a) $2(5 - 2x) + 3 = x - 2$

(b) $\frac{5}{2x - 1} = \frac{2}{3x + 4}$

11. (12 points) Solve each of the following nonlinear equations for x .

(a) $6x^3 + 60x = x^3 + 40x^2$

(b) $3x^2 + 5 = 1 - 7x$

(c) $x^3 - 4x^2 - x = -4$

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12. (5 BONUS points) Suppose a particular store charges its customers a 5% surcharge for using a credit card, but your credit card company gives you a 5% discount on all purchases made at this store. In this situation, is it better to pay with cash or with a credit card? Or does it not matter? Explain your reasoning.