Math 121
Exam 1

Justify all answers with neat and organized work. Clearly indicate your answers. 100 points possible.

1. (5 pts.) Is -4 a rational number?

2. (5 pts.) Perform the operation (write fractional answers in reduced form).

$$20 \div \tfrac{1}{5}$$

3. (4 pts.) Simplify the expression. Do not leave negative exponents or fractional exponents in your answer.

$$(9x^2)^{-2}$$

4. (4 pts.) Simplify the expression. Do not leave negative exponents or fractional exponents in your answer.

$$\left(\frac{a^{-3}}{b^{-3}}\right)\left(\frac{a}{b}\right)^2$$

5. (4 pts.) Simplify by removing all possible factors from the radical. Do not leave negative exponents or fractional exponents in your answer.

$$\sqrt{45x^4y^{-6}}$$

6. (4 pts.) Simplify the expression. Do not leave negative exponents or fractional exponents in your answer.

$$\frac{(3x^2)^{3/2}}{3^{1/2}x^5}$$

7. (4 pts.) Rationalize the numerator. Then simplify your answer.

$$\frac{\sqrt{27}}{3}$$

8. (5 pts.) Perform the operation and write the result in standard form.

$$5z - [3z - (10z + 8)]$$

9. (5 pts.) Find the product.

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

10. (5 pts.) Find the product.

$$(x + 2)^3$$

11. (5 pts.) Completely factor the expression.

$$3x^3 + x^2 + 15x + 5$$

12. (5 pts.) Completely factor the expression.

$$20x^2 + 7x - 6$$

13. (5 pts.) Completely factor the expression.

$$4(x+3)^3(x+4)^7 + 7(x+3)^4(x+4)^6$$

14. (5 pts.) Perform the operation and simplify.

$$\frac{6}{x+2} - \frac{3}{x-4}$$

15. (5 pts.) Perform the operation and simplify.

$$\frac{\left[\dfrac{x}{(x+3)^4}\right]}{\left[\dfrac{x^3}{(x+3)^3}\right]}$$

16. (5 pts.) Find the distance between the points $(-3, 2)$ and $(4, -3)$.

17. (5 pts.) Find the standard form of the equation of the specified circle.

Center: $(5, -2)$; solution point: $(2, 1)$

18. (5 pts.) Find the standard form of the equation of the specified circle.

Endpoints of a diameter: $(0, 0)$, $(16, 12)$

19. (5 pts.) Solve the equation.

$$5x - 8 = 15x + 3$$

20. (5 pts.) Solve the equation.

$$\tfrac{3}{2}(z+5) - \tfrac{1}{4}(z+24) = 0$$

21. (5 pts.) Two cars start at a given point and travel in the same direction at average speeds of 35 miles per hour and 60 miles per hour. How much time must elapse before the two cars are 5 miles apart?