

Final Exam

Date _____ Period _____

Simplify.

1) $\sqrt{108x^3}$

A) $7x\sqrt{7}$

B) $4\sqrt{2x}$

C) $6x\sqrt{3x}$

D) $6x\sqrt{2x}$

2) $\sqrt[3]{875n^3}$

A) $4n\sqrt[3]{2n^2}$

B) $3n\sqrt[3]{6}$

C) $5n\sqrt[3]{7}$

D) $4n^2\sqrt[3]{5n^2}$

3) Show all work for credit.

$$\frac{\sqrt{3}}{2 - 5\sqrt{5}}$$

A) $\frac{2\sqrt{3} - 5\sqrt{15}}{3}$

B) $\frac{16 - 4\sqrt{3}}{13}$

C) $\frac{-8 - 10\sqrt{2}}{17}$

D) $\frac{-2\sqrt{3} - 5\sqrt{15}}{121}$

4) $\frac{2 + 3i}{-8 + 10i}$

A) $\frac{7 - 22i}{82}$

B) $\frac{-1 - 32i}{82}$

C) $\frac{-8 - 10i}{41}$

D) $\frac{7 - 11i}{41}$

5) Given $a = -5 - 2i$ and $b = 1 + 4i$, what is $a \cdot b$?

A) $3 - 22i$

B) $3 + 22i$

C) $13 + 18i$

D) $2 - 26i$

Solve each equation with the quadratic formula.

6) $9b^2 - 10b = -11$

A) $\left\{ \frac{-3 + i\sqrt{71}}{8}, \frac{-3 - i\sqrt{71}}{8} \right\}$

B) $\left\{ \frac{5 + i\sqrt{74}}{9}, \frac{5 - i\sqrt{74}}{9} \right\}$

C) $\left\{ \frac{-5 + i\sqrt{311}}{14}, \frac{-5 - i\sqrt{311}}{14} \right\}$

D) $\{-5 + \sqrt{14}, -5 - \sqrt{14}\}$

Solve each equation by factoring.

7) What are the two factors that you get when you are solving the following:

$$x^2 = -9x - 18$$

A) $\{x - 6, x - 3\}$

B) $\{x + 6, x + 3\}$

C) $\{x + 6, x - 3\}$

D) $\{x - 6, x + 3\}$

Divide, using long division or synthetic division.

8) if $x = b^3 - 11b^2 + 22b + 34$ and $y = b - 4$, what is $x \div y$?

You can use synthetic or long division.

A) $b^2 - 6b - 6 + \frac{8}{b - 4}$

B) $b^2 - 4b - 7 + \frac{9}{b - 4}$

C) $b^2 - 5b - 4 + \frac{14}{b - 4}$

D) $b^2 - 7b - 6 + \frac{10}{b - 4}$

Expand completely, using the Binomial Theorem.

9) If $x = 3b + 1$, what is x^4 ? Use Pascal's Triangle.

- A) $81b^4 + 162b^3 + 54b^2 + 12b + 1$
- B) $81b^4 + 162b^3 + 63b^2 + 12b + 1$
- C) $486b^4 + 405b^3 + 180b^2 + 45b + 6$
- D) $81b^4 + 108b^3 + 54b^2 + 12b + 1$

Perform the indicated operation.

10) $f(t) = -3t + 4$

$g(t) = 4t - 3$

Find $(f \cdot g)(t)$

- A) $-3t^3 + 4t^2 - 3t + 4$
- B) $-12t^2 + 25t - 12$
- C) $-12t^2 - 25t - 12$
- D) $-3t^3 + 2t^2 - 12t + 8$

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

$g(x) = x - 5$

Find $(f \circ g)(7)$

- A) 10 B) 0
- C) 65 D) 23

Find the inverse of each function.

12) $f(x) = \frac{6-x}{2}$

- A) $f^{-1}(x) = -2x - 4$
- B) $f^{-1}(x) = \frac{2}{3}x - 2$
- C) $f^{-1}(x) = -2x + 6$
- D) $f^{-1}(x) = 5x + 15$

Write a polynomial function of least degree with integral coefficients that has the given zeros.

13) 4, -1, 2

- A) $f(x) = x^3 - 5x^2 + 2x + 8$
- B) $f(x) = x^3 - 5x^2 + 4x + 8$
- C) $f(x) = x^3 - 5x^2 + 2x$
- D) $f(x) = x^3 - x^2 + 2x + 8$

Factor each completely.

14) If $x = 8a^3$ and $y = 27b^3$, what is $x - y$ when completely factored?

- A) $(2a - 3b)(4a^2 + 6ab + 9b^2)$ B) $(2a - 3b)(2a + 3b)$
C) $(2a - 3b)^3$ D) $(2a + 3b)(4a^2 - 6ab + 9b^2)$

15) If $a = x^4$, $b = 13x^2$, and $c = 30$, what is $a + b + c$ fully factored?

- A) $(x^2 - 6)(x^2 + 19)$ B) $(x^2 + 3)(x^2 + 10)$
C) $(x^2 + 30)(x^2 + 1)$ D) $(x - 1)(x + 1)(x^2 + 14)$

16) If $x = 30b^3 - 48b^2$ and $y = 80b - 128$, what is $x + y$ completely factored?

- A) $2(5b + 8)(3b^2 - 8)$ B) $2(3b^2 - 8)(5b - 8)$
C) $2(3b^2 + 8)(5b - 8)$ D) $2(3b^2 - 8)^2$

State the possible rational roots for each equation. Then find all rational roots.

17) $64x^6 - 1 = 0$

A) Possible rational roots: $0, \pm 1$

Rational roots: $\left\{\frac{1}{2}, -\frac{1}{2}\right\}$

B) Possible rational roots: $\pm 1, \pm 2, \pm 5, \pm 10$

Rational roots: $\left\{-\frac{1}{3}, -\frac{1}{2}\right\}$

C) Possible rational roots:

$$\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}, \pm \frac{1}{8}, \pm \frac{1}{16}, \pm \frac{1}{32}, \pm \frac{1}{64}$$

Rational roots: $\left\{\frac{1}{2}, -\frac{1}{2}\right\}$

D) Possible rational roots: $\pm 1, \pm 2, \pm 4, \pm \frac{1}{2}$

Rational roots: $\left\{\frac{1}{2}, -\frac{1}{2}\right\}$

Find all roots. One root has been given.

18) $x^4 + 6x^3 + 3x^2 - 10x = 0; -5$

A) $\{0, -2 \text{ mult. } 2, -5\}$

B) $\{0, -4, -2, -5\}$

C) $\left\{0, -2, \frac{1}{3}, -5\right\}$

D) $\{0, -2, 1, -5\}$

Simplify each expression.

19) If $x = n^2 - 4n + 4$ and $y = n^2 - 11n + 18$, what does $\frac{x}{y}$ simplify to?

A) $\frac{n+10}{6}$ B) $\frac{n-2}{n-9}$ C) $\frac{7n-2}{3n-5}$ D) $\frac{n+1}{8n}$

State the excluded values for each.

20) $\frac{24n-32}{24n+32}$

A) $-\frac{4}{3}$ B) $\frac{3}{4}$

C) $\frac{4}{3}$ D) $-\frac{3}{4}$

Simplify each expression.

21) If $x = \frac{8v - 56}{40v + 64}$ and $y = \frac{2v^2 + 18v + 28}{10v^2 + 36v + 32}$, what is $x \div y$?

A) $\frac{v - 7}{v + 7}$

B) $\frac{v - 8}{90}$

C) $\frac{(v + 7)(v - 1)}{2}$

D) $\frac{1}{2v(v - 8)}$

22) If $x = \frac{6}{r - 2}$ and $y = \frac{5r}{r + 6}$, what is $x + y$?

A) $\frac{2r + 2}{5r - 2}$

B) $\frac{4r^2 - 3r + 2}{2(r - 1)(r + 2)}$

C) $\frac{6r^2 - 5r + 2}{2(r - 1)(r + 2)}$

D) $\frac{-4r + 36 + 5r^2}{(r - 2)(r + 6)}$

23) If $x = \frac{2}{2b - 5}$ and $y = \frac{2}{b - 5}$, what is $x - y$?

A) $\frac{-6b - 5 + 2b^2}{(b - 5)(2b - 5)}$

B) $\frac{-b - 5}{(b - 5)(2b - 5)}$

C) $\frac{1}{b}$

D) $-\frac{2b}{(b - 5)(2b - 5)}$