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Advanced Algebra II Honors - Cumulative Review #1

All work must be done on a separate sheet of paper.

1. Solve for x.

(a) $|3x-15| \geq 6$ **(b)** $x^2-2x=24$ **(c)** $x(x-1)(2x+1)=0$ **(d)** $2x^2-7x=15$

2. Find the zeros for: $g(x)=\dfrac{x^2-5x+6}{x^2-2x}$

3. Given $f(x)=-x^2+3$. If the domain of $f(x)$ is $x \geq 1$, find

(a) the range **(b)** $f(a+5)$ **(c)** $f(f^{-1}(x))$

4. If $f(x)=|x|$, find $f(-2.5)$

5. Find $f^{-1}(x)$ for:

(a) $f(x)=\{(-2,3),(-1,-1),(3,-2)\}$ **(b)** $5x-2y=10$ **(c)** $f(x)=x^2-5$ for $x \leq 0$.

6. If $f(x)=x^2-1$ and $g(x)=1/x$ find:

(a) $f(g(x))$ and its domain **(b)** $g(f(x))$ and its domain

7. Simplify: **(a)** $\dfrac{81^{-\frac{5}{4}}}{9^{\frac{3}{2}}}$ **(b)** $\left(\dfrac{x^5}{25}\right)^{-\frac{3}{2}}$

8. Solve for x: $x-1=\sqrt{3x+7}$

9. Solve for x: $32^{x+1}=8$

10. Solve for x: $\dfrac{9}{x-2}-\dfrac{6}{x}=3$

11. Simplify: $(-3x^{-5}y^2)^{-4}$

12. Simplify: $\dfrac{4x+6y}{\frac{4}{x}+\frac{6}{y}}$

13. Simplify: $\sqrt{8x^3y}+z\sqrt{50xy}-4\sqrt{18x^3y}$

14. Solve for x: $\log_x 25=\dfrac{1}{2}$

15. Expand: $(\sqrt{x}+\sqrt{7})^2$

16. Simplify: $\left(\dfrac{5}{7}\right)^{-3}$

17. What is the equation of the line passing through (4,0) and (0, - 2)?

18. Solve: $3^{\frac{x}{5}}=\dfrac{1}{27}$

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Advanced Algebra II Honors - Cumulative Review #2

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For problems 1- 6, simplify the expression completely..

1. $-\sqrt{-81}$ **2.** $(6-5i)(6+5i)$ **3.** $(12-10i)-(-3+4i)$ **4.** $i^5+i^6+i^{38}$ **5.** $\dfrac{2-5i}{i}$ **6.** $\dfrac{2-5i}{3+4i}$

7. Factor $x^2 + 9$ over the set of complex numbers.

8. Solve for x: $3x^2 + 2 = 4x$

9. Solve for x: $x^2 + 2ix + 3 = 0$

10. Solve for x: $\sqrt{x+8} = 3 - i$

11. Determine the nature of the roots of each equation without solving.

(a) $3x^2 = 4x - 2$ **(b)** $x^2 + 5x - 3 = 0$

12. Find the equation of the line that is the perpendicular bisector of the segment with endpoints (7, -3) and (-8, 2).

13. Solve for x: $\dfrac{1}{a} - \dfrac{1}{b} = \dfrac{1}{x}$

14. Write the equation of the line passing through (–1, -2) and parallel to $5x - 2y = 10$.

15. Solve each system.

(a) $2x - y = 5$, $y = x - 3$ **(b)** $5x - 3(y + x) = -6$, $2x - 3y = 3$ **(c)** $3x + y = 1$, $2y = 2 - 6x$ **(d)** $5x - 2y = 20$, $7x + 4y = 11$

16. Alice is 4 years older than Bob. Two years ago, she was 1.5 times as old as Bob. Find their present ages.

17. (OMITTED)

18. Simplify: $\dfrac{\frac{1}{a} - b}{\frac{a}{b} - a}$

19. y varies directly as x and inversely as z. If $y = 12$ when $x = 2$ and $z = 7$ find y when $x = 3$ and $z = 9$.

20. Simplify: $\dfrac{x^5}{x^3 - x^5}$

21. Write the equation of a polynomial of lowest degree with real coefficients and 2 and $1 - i$ as two of its roots.

22. The Supreme Shipping Company can load its trucks with both rectangular and cylindrical containers. A rectangular container has a volume of 100 cubic feet and weighs 200 lbs. A cylindrical container has a volume of 200 cubic feet and weighs 100 lbs. Each truck has room for at most 4200 cubic feet of containers and can carry a maximum weight of 4800 lbs. Let x denote the number of rectangular containers and y denote the number of cylindrical containers. If the Supreme Shipping charges $60 to ship either a rectangular or a cylindrical container, what combination of containers should Supreme Shipping use to maximize its income?

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Advanced Algebra II Honors - Cumulative Review #3

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Problems 1-4 are omitted.

5. A rectangular field adjacent to the straight bank of a river is to be fenced but the side by the river will not be. If 180 meters of fencing is available, find the maximum area that can be fenced.

6. Graph each equation.

(a) $y = |x|$ **(b)** $y = |x+2|$ **(c)** $y = |2x|$

(b) $y = 3|x|+4$ **(d)** $y = |x-1|-3$ **(f)** $y = -3x^2 - 5x - 8$

7. Solve: **(a)** $|5x+6| \geq 16$ **(b)** $7^{2\log_7 x} = 36$ **(c)** $\log_6 x + 7 = 8$

8. A limousine shuttle service operating between an airport and the center of a city charges a fare of \$12 and carries 400 persons per day. The firm estimates that business will decrease by 10 passengers per day for each increase of \$1 in the fare. Find the most profitable fare to charge for the service.

9. If $f(x) = \sqrt{x+8}$ and $g(x) = x^2 - 6$, find $f(g(x))$ and $g(f(x))$ and state the domain for each one.

10. Solve each inequality.

(a) $2x^3 - x^2 > x$ **(b)** $4x^2 + 5x - 6 < 0$

11. Find the roots of the polynomial $f(x) = x^3 + 2x^2 - 5x - 6$. Sketch the graph.

12. If $P(x) = 2x^3 - x^2 + 3$, use synthetic substitution to find:

(a) $P(2)$ **(b)** $P(3/2)$ **(c)** $P(i)$

13. Simplify completely:

(a) $\sqrt{60} + 3\sqrt{105} - \sqrt{\frac{20}{27}}$ **(b)** $\sqrt[5]{\frac{128x^7y^{23}z^{-4}}{243x^{-5}z}}$ **(c)** $\sqrt[6]{125} \cdot \sqrt[4]{\sqrt[3]{625}}$

14. Solve:

(a) $\sqrt{x-3} + 7 = 4$

(b) $\sqrt{30-x} = x$

(c) $\sqrt{4x+3} - 2\sqrt{x-1} = 1$

15. Graph: **(a)** $f(x) = -2\sqrt{x-1} + 3$ **(b)** $f(x) = 3\sqrt[3]{4-x} + 1$

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Advanced Algebra II Honors - Cumulative Review #4

All work must be done on a separate sheet of paper.

1. Recreation Unlimited produces footballs and basketballs. Producing a football requires 4 hours on machine A and 2 hours on machine B. Producing a basketball requires 6 hours on machine A, 6 hours on machine B, and 1 hour on machine C. Machine A is available 120 hours per week, machine B is available 72 hours per week, and machine C is available 10 hours per week. If the company profits $3 on each football and $2 on each basketball, how many of each should be produced to maximize the company's profit?

2. Fashion Furniture makes two kinds of chairs, rockers and swivels. Producing a rocker requires 2 hours on machine A and 3 hours on machine B. To produce a swivel, 4 hours are required on Machine A and 1 hour on machine B. Machine A is limited to 20 hours per day. Machine B is limited to 15 hours per day. The profit for a rocker is $12 and the profit for a swivel is $10. How many chairs of each kind should Fashion Furniture make each day to maximize profit?

3. An airline transports 800 people a week between two cities. A round trip ticket costs $300. The company wants to increase the price. They estimate that for each $5 increase 10 passengers will be lost. What ticket price will maximize their income?

4. A camper rowed 24 km downstream and then returned the same distance upstream in twice the time of the downstream trip. If the camper can row 6 km/h in still water, find the rate of the current.

5. With the help of a tailwind, a plane flew 378 km in ¾ of the time that a second plane flew 456 km in the opposite direction. Find the rate of the tailwind if each plane can fly 600 km/h in still air.

6. Work crew A takes 15 hours to do a job and crew B can do it in 10 hours. If B starts 3 hours after A has begun, what is the total time needed for the two crews to do the job?

7. Ned can mow a lawn in 75 minutes and Steve can do it in 50 minutes. If Steve watches Ned mow for 20 minutes and then helps to finish the job, find the total time for the job.

8. A bond that pays 12% per year, compounded quarterly (4 times each year or every 3 months) is bought for $6,000 and after a number of years it is worth $19,500. Find out how many years it took for the bond to be worth this amount.

9. Solve using linear combinations:

$$\begin{aligned} 2x - 3y + 5z &= 13 \\ -3x + 3y - 2z &= -8 \\ 5x - 2y + 4z &= 2 \end{aligned}$$

10. The amount of force you must exert on a wrench handle to loosen a rusty bolt depends on how long the wrench handle is. Suppose that for a particular bolt, a wrench 7 inches long would require a force of 270 pounds and a wrench 21 inches long would require 90 pounds.
    - **(a)** How does force vary with length? Write the general equation.
    - **(b)** Write the particular equation.
    - **(c)** Find the force needed for a wrench with a handle of 3 inches.

11. The number of pounds you weigh is directly proportional to the number of kilograms you are. Kay Dense steps onto a scale calibrated in kilograms and finds that she is 50 kilograms. She knows that she weighs 110 pounds.

(a) Write the particular equation expressing pounds in terms of kilograms.

(b) How many kilograms would Stan Dupp be if he weighed 165 pounds?

12. Given the equation: $y = x^2 - 6x + 9$.

(a) What is the domain and range of the function?

(b) Find the inverse of this function. Is the inverse a function?

(c) What are the domain and range of the inverse?

13. Simplify: $\dfrac{6+i}{2-i}$

14. Solve: $\dfrac{\frac{1}{y}+5}{y} = 3$

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Advanced Algebra II Honors - Cumulative Review #5

All work must be done on a separate sheet of paper.

1. The coach and players of the Blackburn High School football team shared the expense of a bus trip to attend a professional football game. When 5 players were unable to go, each person had to pay an additional $1.50 to cover the total cost of $540. How many people made the trip?

2. A sprinkler system shoots a stream of water that follows a parabolic path. The nozzle is fastened at ground level and water reaches a maximum height of 26 feet at a horizontal distance of 50 feet (from the nozzle). Find the equation that describes the path of the water. Use the location of the nozzle as the origin.

3. Big Bertha, a cannon used in World War I, could fire shells incredibly long distances. The path of the shell could be modeled by $y = -0.0196x^2 + 1.37x$ where x was the horizontal distance traveled (in miles) and y was the height (in miles). How far could Big Bertha fire a shell? What was the shell's maximum height?

4. One cleaning fluid contains 6% ammonia, while a second contains 26% ammonia. In blending these fluids, at most how many liters of the second may be added to 10 liters of the first, if the percent of ammonia in the mixture is not to exceed 16%.

5. Simplify: $\dfrac{x}{x^2-9x+18} - \dfrac{x-2}{x^2-10x+24}$

6. Graph: $y = [\![x+2]\!]$

7. Graph: $f(x) = \begin{cases} x+3, & x > 1 \\ -x^2, & x \le 1 \end{cases}$ State the domain and range.

8. Find the inverse of : **(a)** $f(x) = 5x - 6$ **(b)** $f(x) = x^2 + 6x + 9$ Is the inverse a function in both problems?

9. Solve: $\log_5(\log_8(\log_2 x)) = 0$

10. Solve: $\log_3 x + \log_3(x-2) = 1$

11. Write as a single log: $\log_2 6 + \log_2 a - 3\log_2 5$

12. Solve: $\sqrt{\dfrac{9^{x+6}}{27^x}} = 243$

13. Simplify: $\dfrac{4}{\sqrt[3]{3}}$

14. Simplify: $\dfrac{16}{\sqrt[4]{8}}$

15. Find the quadratic equation with the roots $2 + 3i$ and $2 - 3i$ using sum and products of roots.

16. Given: $f(x) = \dfrac{x+3}{x^2-2x-15}$, plot the graph.

    Based on your graph, what two different things could happen when the value of x makes the denominator equal zero?

17. Factor: **(a)** $8x^3 - 125$ **(b)** $64x^3 + 27y^3$

18. Expand: $(2x - 3)^6$

19. Find the zeros of $P(x) = x^3 + 5x^2 - 2x - 24$

20. Find the zeros of $P(x) = x^3 + 2x^2 - 13x + 10$

21. Perform the indicated operation.

(a) $\dfrac{5y}{1-2y} - \dfrac{2y}{2y+1} + \dfrac{3}{4y^2-1}$

(b) $5(x+3)^{-1} + 4(x+3)^{-1} - 2(x+3)^{-2}$

22. Simplify:

(a) $\dfrac{\dfrac{y}{x+y} + \dfrac{x+y}{y}}{\dfrac{x-y}{x} + \dfrac{y}{x+y}}$

(b) $\dfrac{3a^{-1} + 3b^{-1} - 6a^{-1}b^{-1}}{4a^{-1} + 4b^{-1} - 8a^{-1}b^{-1}}$