NudgeLearn

Algebra 1 · Math

Final Test — Form A

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28 problems

1. Solve for x: $3(2x-4)=18$.

Answer $x=5$

Distribute: $6x-12=18$. Add 12: $6x=30$, so $x=5$.

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2. Simplify the expression $5x-3(x-4)+2$.

Answer $2x+14$

Distribute: $5x-3x+12+2$. Combine like terms: $2x+14$.

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3. Solve the inequality and write the solution: $-2x+5\leq 11$.

Answer $x\geq -3$

Subtract 5: $-2x\leq 6$. Divide by -2 and flip the sign: $x\geq -3$.

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4. Solve the literal equation for h: $A=\frac{1}{2}bh$.

Answer $h=\frac{2A}{b}$

Multiply both sides by 2: $2A=bh$. Divide by b: $h=\frac{2A}{b}$.

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5. Find the slope of the line through the points $(2,1)$ and $(6,9)$.

Answer 2

Slope $=\frac{9-1}{6-2}=\frac{8}{4}=2$.

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6. Simplify, writing the answer with positive exponents: $\frac{12x^5y^2}{3x^2y^6}$.

Answer $\frac{4x^3}{y^4}$

Divide coefficients: $12/3=4$. Subtract exponents: $x^{5-2}=x^3$, $y^{2-6}=y^{-4}$. So $\frac{4x^3}{y^4}$.

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7. Simplify using exponent rules: $(2x^3)^4$.

Answer $16x^{12}$

Raise each factor to the 4th power: $2^4=16$ and $(x^3)^4=x^{12}$. So $16x^{12}$.

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8. Write the equation of the line, in slope-intercept form, with slope -3 that passes through the point $(2,4)$.

Answer $y=-3x+10$

Use $y=mx+b$ with $m=-3$: $4=-3(2)+b$, so $b=10$. Thus $y=-3x+10$.

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9. Simplify the radical: $\sqrt{72}$.

Answer $6\sqrt{2}$

$72=36\cdot 2$, so $\sqrt{72}=\sqrt{36}\,\sqrt{2}=6\sqrt{2}$.

10. Multiply the polynomials: $(x+5)(x-3)$.

Answer $x^2+2x-15$

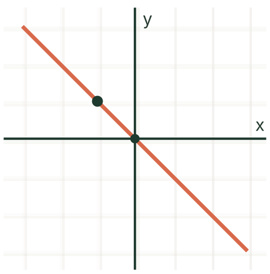
FOIL: $x^2-3x+5x-15=x^2+2x-15$.

11. Simplify: $(2x^2+5x-1)-(x^2-3x+4)$.

Answer x^2+8x-5

Distribute the minus sign: $2x^2+5x-1-x^2+3x-4=x^2+8x-5$.

12. Identify the equation of the line graphed below.



Answer $y=-x$

The line passes through the origin $(0,0)$ and through $(-1,1)$, so its slope is -1 and y-intercept is 0: $y=-x$.

13. Solve the system by substitution: $\begin{cases} y=2x-1 \\ 3x+y=9 \end{cases}$

Answer $(2,3)$

Substitute: $3x+(2x-1)=9 \Rightarrow 5x=10 \Rightarrow x=2$. Then $y=2(2)-1=3$.

14. Solve the system by elimination: $\begin{cases} 2x+3y=12 \\ 2x-y=4 \end{cases}$

Answer $(3,2)$

Subtract the second equation from the first: $4y=8 \Rightarrow y=2$. Then $2x-2=4 \Rightarrow x=3$.

15. Factor completely: $x^2+7x+12$.

Answer $(x+3)(x+4)$

Find two numbers with product 12 and sum 7: 3 and 4. So $(x+3)(x+4)$.

16. Which is the complete factorization of x^2-49?

Answer **B)** $(x+7)(x-7)$

Difference of squares: $x^2-49=x^2-7^2=(x+7)(x-7)$.

17. Solve by factoring: $x^2-5x-14=0$.

Answer $x=7$ **or** $x=-2$

Factor: $(x-7)(x+2)=0$, so $x=7$ or $x=-2$.

18. For the function $f(x)=x^2-4x+1$, find $f(3)$.

Answer -2

$f(3)=3^2-4(3)+1=9-12+1=-2$.

19. A relation is given by the set of points $\{(1,2),(3,5),(4,5),(6,8)\}$. State its domain and range.

Answer **Domain** $\{1,3,4,6\}$; **Range** $\{2,5,8\}$

Domain is the set of x-values: $\{1,3,4,6\}$. Range is the set of y-values (list each once): $\{2,5,8\}$.

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20. Solve using the quadratic formula. Give exact answers in simplest radical form: $x^2 - 6x + 4 = 0$.

Answer $x = 3 \pm \sqrt{5}$

$a = 1,\ b = -6,\ c = 4.\ x = \dfrac{6 \pm \sqrt{36-16}}{2} = \dfrac{6 \pm \sqrt{20}}{2} = \dfrac{6 \pm 2\sqrt{5}}{2} = 3 \pm \sqrt{5}.$

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21. How many real solutions does $x^2 + 2x + 5 = 0$ have? Justify with the discriminant.

Answer **No real solutions**

Discriminant $= b^2 - 4ac = 2^2 - 4(1)(5) = 4 - 20 = -16 < 0$, so there are no real solutions.

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22. Which sequence is arithmetic?

Answer **B)** $5,\ 8,\ 11,\ 14,\ \ldots$

An arithmetic sequence has a constant difference. Choice B adds 3 each time. A and D multiply (geometric); C has changing differences.

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23. An arithmetic sequence has first term 4 and common difference 3. Write a formula for the nth term a_n, then find a_{10}.

Answer $a_n = 3n + 1$; $a_{10} = 31$

$a_n = a_1 + (n-1)d = 4 + 3(n-1) = 3n + 1$. So $a_{10} = 3(10) + 1 = 31$.

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24. A geometric sequence has first term 5 and common ratio 2. Write a formula for the nth term a_n, then find a_6.

Answer $a_n = 5 \cdot 2^{n-1}$; $a_6 = 160$

$a_n = a_1 \cdot r^{n-1} = 5 \cdot 2^{n-1}$. So $a_6 = 5 \cdot 2^5 = 5 \cdot 32 = 160$.

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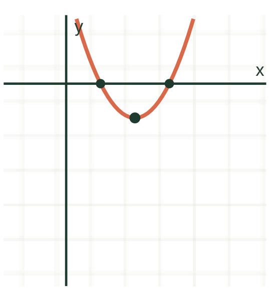
25. The parabola $y = x^2 - 4x + 3$ is graphed below. State the coordinates of the vertex and the equation of the axis of symmetry.



Answer **Vertex** $(2,-1)$; **axis of symmetry** $x = 2$

Axis: $x = -\dfrac{b}{2a} = -\dfrac{-4}{2(1)} = 2$. Then $y = 2^2 - 4(2) + 3 = -1$, so the vertex is $(2,-1)$.

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26. A gym membership costs a $\$40$ sign-up fee plus $\$25$ per month. Write a linear equation for the total cost C after m months, then find the cost after 8 months.

Answer $C = 25m + 40$; $\$240$

Fixed fee $\$40$ plus $\$25$ each month: $C = 25m + 40$. After 8 months: $C = 25(8) + 40 = \$240$.

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27. A new bicycle costs $\$500$ and loses 10% of its value each year. Write an exponential model for its value V after t years, then find its value after 2 years.

Answer $V = 500(0.9)^t$**;** $\$405$

Decay of 10% keeps 90% each year: $V = 500(0.9)^t$. After 2 years: $V = 500(0.81) = \$405$.

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28. A soccer ball is kicked upward. Its height in feet after t seconds is $h = -16t^2 + 32t$. How many seconds until the ball lands back on the ground ($h = 0$)?

Answer 2 **seconds**

Set $h = 0$: $-16t^2 + 32t = 0 \Rightarrow -16t(t-2) = 0$. So $t = 0$ (kick) or $t = 2$. The ball lands at $t = 2$ seconds.