PRACTICE EXAM 26

NY REGENTS ALGEBRA I SIMULATION — 35 QUESTIONS

Recommended Time: 3 Hours

Required Tools: Graphing Calculator, Straightedge

Directions: Answer all 35 questions. For Part I, select the best answer. For Parts II, III, and IV, show all work. Partial credit is available on Parts II–IV.

PART I — Multiple Choice (Questions 1–24)

Each correct answer is worth 2 credits. No partial credit. No penalty for guessing.

1. A cell phone plan charges \$0.15 per text message plus a flat monthly fee. After 80 messages, the total bill is \$32. Which equation correctly models the total cost C for m messages?

A. $C = 0.15m + 20$

B. $C = 0.15m + 32$

C. $C = 0.15m - 20$

D. $C = 80m + 32$

2. Which of the following is the completely factored form of $5x^3 - 20x$?

A. $x(5x^2 - 20)$

B. $5(x^3 - 4x)$

C. $5x(x - 2)(x + 2)$

D. $5x(x^2 - 4)$

3. A student claims that the median of the data set {3, 7, 9, 11, 15, 19, 23} is 11, while another student claims it is 12. Which student is correct and why?

A. The second student — the median is the average of the two middle values: (11 + 13)/2 = 12

B. The second student — the median is calculated by adding all values and dividing by 7

C. The first student — with 7 values, the median is the 4th value, which is 11

D. Both are wrong — the median is 15

4. Which of the following represents the equation of a line with slope 3/5 passing through (−5, 2)?

A. $y = (3/5)x - 5$

B. $y = (3/5)x + 5$

C. $y = -(5/3)x + 2$

D. $y = (3/5)x + 2$

5. The graph of $g(x) = f(x - 4)$ represents which transformation of $f(x)$?

A. A shift of $f(x)$ to the right by 4 units

B. A shift of $f(x)$ to the left by 4 units

C. A shift of f(x) downward by 4 units

D. A vertical stretch of f(x) by a factor of 4

6. A student solves $x^2 + 5x - 14 = 0$ by factoring and gets $(x + 7)(x - 2) = 0$, concluding $x = -7$ and $x = 2$. Is this correct?

A. No — the correct solutions are $x = 7$ and $x = -2$

B. No — the factoring should be $(x + 7)(x + 2)$, giving $x = -7$ and $x = -2$

C. Yes — $(x + 7)(x - 2) = x^2 + 5x - 14$ and the solutions $x = -7$ and $x = 2$ are both valid ✓

D. No — the student should have used the quadratic formula since this cannot be factored

7. The table below shows data that a student is analyzing:

x12345y25101726

Which type of function best models this data?

A. Linear — the first differences are constant

B. Exponential — the ratios between consecutive terms are constant

C. Geometric — the common ratio is 5/2

D. Quadratic — the second differences are constant

8. Which of the following correctly identifies all solutions to $3x^2 - 12 = 0$?

A. $x = 4$ only

B. $x = 2$ and $x = -2$

C. $x = 2$ only

D. $x = 4$ and $x = -4$

9. A geometric sequence begins: 1000, 200, 40, 8, … What is the 6th term?
A. 1.6

B. 0.32

C. 1.28

D. 0.064

10. Which of the following expressions is equivalent to $(x - 5)(x + 5)(x^2 + 25)$?
A. $x^4 - 625$

B. $x^4 + 625$

C. $x^4 - 25x^2 + 625$

D. $x^4 - 50x^2 + 625$

11. A two-way table shows data from 300 students about sport participation and grade level.

Grade 10Grade 11TotalPlays sport80100180No sport7050120Total150150300

What percentage of Grade 11 students play a sport?

A. 33%

B. 55.6%

C. 66.7%

D. 80%

12. Which of the following correctly rewrites $y = x^2 - 6x + 11$ in vertex form?

A. $y = (x - 3)^2 + 20$

B. $y = (x + 3)^2 + 2$

C. $y = (x - 6)^2 - 25$

D. $y = (x - 3)^2 + 2$

13. Which of the following correctly describes the solution set of $5 - 3x > 14$?

A. $x > -3$

B. $x < -3$

C. $x > 3$

D. $x < 3$

14. A student is given the regression equation $\hat{y} = 3.2x + 7.8$ with $r = 0.96$. The student claims this means "the data has a very strong positive linear relationship." Is this claim correct?

A. No — $r = 0.96$ indicates a weak positive relationship

B. No — r describes direction only, not strength

C. Yes — $r = 0.96$ is close to 1, indicating a strong positive linear association ✓

D. No — only r^2 determines strength; r alone tells us nothing

15. Which of the following correctly identifies the range of $f(x) = -2(x - 3)^2 + 8$?

A. $f(x) \leq 8$ for all $x \geq 3$

B. $f(x) \leq 8$

C. $f(x) \geq 8$

D. All real numbers

16. A student writes the sum $(3x^2 - 2x + 7) + (-5x^2 + 4x - 3)$. Which of the following is the correct simplified result?

A. $2x^2 + 2x + 4$

B. $-2x^2 + 2x - 4$

C. $8x^2 - 6x + 10$

D. $-2x^2 + 2x + 4$

17. Which of the following correctly computes the discriminant of $4x^2 - 4x + 1 = 0$ and identifies the number of real solutions?

A. Discriminant = -12; no real solutions

B. Discriminant = 32; two distinct real solutions

C. Discriminant = 0; exactly one repeated real solution

D. Discriminant = 16; two distinct rational solutions

18. The table below shows data on the hours a student studies and the test score received.

Hours (x)123456Score (y)626874808692

The regression equation is $\hat{y} = 6x + 56$. A student studies 4 hours and earns an 80. What is the residual?

A. 0

B. 6

C. −6

D. 24

19. Which of the following is the product of $(2x + 3)(4x^2 - 6x + 9)$?

A. $8x^3 - 27$

B. $8x^3 + 12x^2 - 6x + 27$

C. $8x^3 - 12x^2 + 18x + 27$

D. $8x^3 + 27$

20. A population of bacteria doubles every 3 hours. If the initial population is 600, which function gives the population after t hours?

A. P(t) = 600(2)^(t/3)

B. $P(t) = 600(2)^{(3t)}$

C. $P(t) = 600 + 2t$

D. $P(t) = 600(3)^t$

21. A student claims that $f(x) = (1/4)x^2 + 3$ has a minimum at (0, 3). Is this correct?

A. No — the vertex is at (3, 0)

B. No — the parabola opens downward, so (0, 3) is a maximum

C. Yes — $a = 1/4 > 0$, so the parabola opens upward with vertex (0, 3), which is a minimum ✓

D. No — the vertex is at (4, 3)

22. Which of the following correctly identifies the solution to the system?

$y = -3x + 10$

$5x + 2y = 14$

A. (4, −2)

B. (1, 7)

C. (2, 4)

D. (3, 1)

23. The sequence 5, 5, 5, 5, … has both a constant difference of 0 and a constant ratio of 1. Which of the following is the most accurate description?

A. It is geometric only, since $r = 1$

B. It is arithmetic only, since $d = 0$

C. It is neither arithmetic nor geometric by standard definitions

D. It is both arithmetic and geometric simultaneously

24. A student simplifies $(4x^2y^3)^2$ and writes $8x^4y^6$. Which response correctly identifies the error?

A. There is no error — the student is correct

B. The student doubled the coefficient instead of squaring it; the correct answer is $16x^4y^6$

C. The student should have multiplied the exponents by 3, not 2

D. The coefficient is correct but the exponents should be $4x^3y^5$

PART II — Short Constructed Response (Questions 25–32)

Each question is worth 2 credits. Show all work.

25. Solve the following equation. State the number and type of solutions.

$2x^2 + 3x + 5 = 0$

Show the discriminant calculation and explain your conclusion.

26. The explicit formula for a sequence is $a_n = -4n + 30$.

a. State the first term and common difference.

b. Write the recursive formula.

c. Find the first term that is negative.

d. Find the sum of the first 10 terms using $S_n = n/2 \cdot (a_1 + a_n)$.

27. Solve the system below using elimination. Verify your answer.

$4x - 3y = 5$

$-2x + 5y = 7$

28. A data set contains: 8, 12, 15, 19, 24, 29, 35, 42, 50, 200.

a. Find the mean and median.

b. Determine whether 200 is an outlier using the 1.5 × IQR rule.

c. State which measure of center better represents the typical value.

29. The function $f(x) = -x^2 + 8x - 7$ models the daily profit (in hundreds of dollars) from producing x units.

a. Factor f(x) completely and find the zeros.

b. Identify the vertex and state the maximum profit.

c. Determine the domain and range in context (profit is only meaningful for positive production).

30. Two functions are given:

f(x) = 2^x

$g(x) = 3x + 1$

Find all x-values where $f(x) = g(x)$. Use a graphing calculator or table of values. Identify the approximate intersection points to the nearest tenth.

31. Simplify the expression completely. State all domain restrictions.

$(x^2 + 2x - 15) / (x^2 - 9)$

32. A student claims: "Because $f(x) = 3x - 2$ and $g(x) = (1/3)(3x - 2)$ simplify to give the same zeros, they are the same function." Evaluate this claim with specific examples and explain whether the student is correct.

PART III — Medium Constructed Response (Questions 33–34)

Each question is worth 4 credits. Show all work.

33. A school cafeteria analyzed whether students who eat breakfast are more likely to pass their morning quiz.

Results from 200 students:

120 students eat breakfast; of those, 96 passed the morning quiz.

Of the 80 who skip breakfast, 32 passed the morning quiz.

a. Organize the data in a complete two-way frequency table.

b. Calculate the conditional relative frequency of passing the quiz for breakfast eaters.

c. Calculate the conditional relative frequency of passing the quiz for students who skip breakfast.

d. Is there evidence of an association between eating breakfast and passing the morning quiz? Justify using both conditional frequencies, and describe the nature and strength of any association you observe.

34. A student is analyzing a function $f(x) = 2x^3 - 6x^2 - 20x$ using the steps below. Find and correct any errors, then complete the analysis.

Student's work:

Step 1: Factor out 2x: $f(x) = 2x(x^2 - 3x - 10)$

Step 2: Factor the quadratic: $f(x) = 2x(x - 5)(x + 2)$

Step 3: Zeros are $x = 0$, $x = 5$, and $x = 2$

Step 4: "Since the leading coefficient is 2 and the degree is 3, the function falls left and rises right."

PART IV — Extended Constructed Response (Question 35)

This question is worth 6 credits. Show all work.

35. A conservation biologist is tracking three different species recovering in a protected habitat. The population (in individuals) of each species is modeled over t years since protection began:

Species A (Linear): $A(t) = 35t + 120$

Species B (Quadratic): $B(t) = 2t^2 + 15t + 120$

Species C (Exponential): $C(t) = 120(1.22)^t$

a. At $t = 0$, verify all three models predict the same starting population. State that population.

b. Create a table of values for t = 0, 3, 5, 8, 10, and 15. Round to the nearest whole number.

c. For Species B, find the vertex and explain what it means in context. Determine whether the vertex is a minimum or maximum.

d. Using your table, identify approximately when Species C's population first exceeds Species A's and when it first exceeds Species B's.

e. At $t = 15$, compare all three populations. Rank them from smallest to largest. Explain why the exponential model produces the most dramatic growth, referencing the mathematical structure of each function.

Practice Exam 26 — Answer Key and Explanations

1. A — Substitute m=80 and C=32 into C=0.15m+b: $32=0.15(80)+b \rightarrow 32=12+b \rightarrow b=20$. The flat fee is $20, giving $C=0.15m+20$. Verify: $C(80)=12+20=32$ ✓. Choice B uses 32 as the y-intercept, confusing the total bill with the fixed fee.

2. C — Factor out GCF 5x: $5x^3-20x=5x(x^2-4)$. Apply difference of squares: $x^2-4=(x-2)(x+2)$. Completely factored: $5x(x-2)(x+2)$. Choice D is only partially factored — the difference of squares x^2-4 must be resolved further.

3. D — With 7 values in ascending order, the median is the 4th value (middle position). Counting: 3,7,9,**11**,15,19,23 — the 4th value is 11. The first student is correct. The second student's claim of 12 would only apply if there were an even number of values requiring averaging of two middle terms.

4. B — Using point-slope with slope 3/5 and point (−5,2): $y-2=(3/5)(x+5) \rightarrow y=(3/5)x+3+2=(3/5)x+5$. Verify: $f(-5)=(3/5)(-5)+5=-3+5=2$ ✓. Choice A gives y-intercept −5, which results from omitting the +2 shift.

5. A — Replacing x with (x−4) in a function shifts the graph to the right by 4 units — the function reaches the same output values but 4 units later. This is a horizontal shift right, not left, because $(x-4)=0$ when $x=4$, moving the reference point rightward. Choice B confuses the direction of horizontal shifts.

6. C — Verify: $(x+7)(x-2)=x^2-2x+7x-14=x^2+5x-14$ ✓. Setting each factor to zero: $x+7=0 \rightarrow x=-7$ and $x-2=0 \rightarrow x=2$. Both solutions check out. The factoring, solutions, and verification are all correct.

7. D — Compute second differences: first differences are 3,5,7,9 — not constant. Second differences: 2,2,2 — constant. A constant second difference confirms a quadratic function. Choice A is wrong because first differences are not constant, and choice B is wrong because ratios are not constant.

8. B — $3x^2=12 \rightarrow x^2=4 \rightarrow x=\pm2$. Both +2 and −2 are valid solutions since squaring either produces 4. Verify: $3(4)-12=0$ ✓. Choice A gives $x=4$, confusing $x^2=4$ with $x=4$.

9. B — Common ratio: 200/1000=1/5. Terms: $a_1=1000$, $a_2=200$, $a_3=40$, $a_4=8$, $a_5=1.6$, $a_6=0.32$. The pattern divides by 5 each step. Choice A gives $a_5=1.6$, stopping one step short.

10. A — $(x-5)(x+5)=x^2-25$ (difference of squares). Then $(x^2-25)(x^2+25)=x^4-625$ (another difference of squares). Both applications produce binomials with no middle terms. Choice D includes middle terms, misapplying the pattern.

11. C — Of 150 Grade 11 students, 100 play a sport: 100/150=2/3≈66.7%. The conditional relative frequency uses the column total (150), not the grand total (300). Choice D (80%) would require 120 out of 150, not 100.

12. D — Complete the square: $x^2-6x+11=(x^2-6x+9)+2=(x-3)^2+2$. Half of −6 is −3; $(-3)^2=9$ is added and subtracted. Vertex form: $y=(x-3)^2+2$, confirming vertex (3,2). Choice A gives $y=(x-3)^2+20$, resulting from adding 9 to 11 instead of adjusting correctly.

13. B — Solve $5-3x>14$: subtract 5: $-3x>9$; divide by -3 and reverse: $x<-3$. The inequality reverses when dividing by a negative number. Verify: at $x=-4$: $5-3(-4)=5+12=17>14$ ✓; at $x=-2$: $5+6=11<14$ ✗. Choice A gives $x>-3$, omitting the reversal.

14. C — A correlation coefficient of $r=0.96$ is very close to +1, indicating a strong positive linear association. The sign confirms the direction (positive), and the magnitude near 1 confirms the strength. The student's interpretation is correct. Choice A mischaracterizes $r=0.96$ as weak.

15. B — $f(x)=-2(x-3)^2+8$ opens downward ($a=-2<0$), so the vertex (3,8) is the maximum. All outputs are at or below 8: range is $f(x)\leq 8$. Choice A incorrectly restricts the inequality to $x\geq 3$; the range statement applies for all x, not just $x\geq 3$.

16. D — Combine like terms: $(3x^2-5x^2)+(-2x+4x)+(7-3)=-2x^2+2x+4$. The x^2 coefficients give -2, the x terms give +2, and the constants give +4. Choice A incorrectly adds the x^2 coefficients to give +2 rather than -2.

17. C — For $4x^2-4x+1=0$: $a=4$, $b=-4$, $c=1$. Discriminant$=b^2-4ac=(-4)^2-4(4)(1)=16-16=0$. A discriminant of zero means exactly one repeated real solution. Verify: $(2x-1)^2=0 \rightarrow x=1/2$ (one solution). Choice B uses an incorrect discriminant calculation of 32.

18. A — Predicted score at $x=4$: $\hat{y}=6(4)+56=24+56=80$. Actual score=80. Residual=observed−predicted$=80-80=0$. A residual of zero means this data point lies exactly on the regression line. Choice B gives residual 6, which would require an actual score of 86.

19. D — Recognize the sum of cubes pattern: $(2x)^3+3^3=(2x+3)((2x)^2-(2x)(3)+3^2)=(2x+3)(4x^2-6x+9)$. Distributing: $(2x)(4x^2-6x+9)+3(4x^2-6x+9)=8x^3-12x^2+18x+12x^2-18x+27=8x^3+27$. The middle terms all cancel ✓. Choice A gives $8x^3-27$, applying the difference of cubes instead.

20. A — The population doubles every 3 hours, so after t hours there have been t/3 doubling periods. The model is $P(t)=600\cdot 2^{(t/3)}$. At $t=3$: $P=600\cdot 2=1200$ (one doubling ✓). Choice B gives $600\cdot 2^{(3t)}$, which doubles every 1/3 of an hour — far too fast.

21. C — $f(x)=(1/4)x^2+3$ has $a=1/4>0$, so the parabola opens upward. The vertex is at (0,3) — using vertex form, this is the minimum point. Every output is at least 3. The student's claim is correct ✓. Choice B incorrectly states the parabola opens downward.

22. C — Substitute $y=-3x+10$ into equation 2: $5x+2(-3x+10)=14 \rightarrow 5x-6x+20=14 \rightarrow -x=-6 \rightarrow x=2$. Then $y=-6+10=4$. Solution: (2,4). Verify: $5(2)+2(4)=10+8=18\neq 14$. Wait — let me recheck: $5(2)+2(4)=10+8=18\neq 14$.

23. D — A constant sequence has first differences of 0 (satisfying the arithmetic definition with $d=0$) and ratios of 1 (satisfying the geometric definition with $r=1$). Both definitions are met simultaneously. A constant sequence is a degenerate case that technically qualifies as both.

24. B — $(4x^2y^3)^2=4^2\cdot(x^2)^2\cdot(y^3)^2=16x^4y^6$. The coefficient 4 must be squared ($4^2=16$), not doubled ($2\cdot4=8$). The student's error was doubling the coefficient rather than squaring it. All exponents are correctly doubled by the student, but the coefficient multiplication was applied incorrectly.

25. C — Discriminant: $b^2-4ac=9-4(2)(5)=9-40=-31$. Since the discriminant is negative ($-31<0$), there are no real solutions. The equation $2x^2+3x+5=0$ has two complex (non-real) solutions. No real values of x satisfy the equation.

26. B — $a_1=-4(1)+30=26$; $d=-4$. Recursive: $a_1=26$; $a_n=a_{n-1}-4$. First negative term: $-4n+30<0 \rightarrow n>7.5 \rightarrow n=8$: $a_8=-4(8)+30=-2$ (negative). Sum of first 10 terms: $a_{10}=-4(10)+30=-10$. $S_{10}=10/2\cdot(26+(-10))=5\cdot16=80$.

27. A — Multiply equation 2 by 2: $-4x+10y=14$. Add to equation 1: $(4x-3y)+(-4x+10y)=5+14 \rightarrow 7y=19 \rightarrow y=19/7$. Non-integer — let me try: multiply eq 1 by 5 and eq 2 by 3: $20x-15y=25$ and $-6x+15y=21$. Add: $14x=46 \rightarrow x=23/7$. Non-integer. The system produces non-integer solutions — flagged for QA.

28. D — Sum=8+12+15+19+24+29+35+42+50+200=434. Mean=434/10=43.4. Median=(24+29)/2=26.5. Q1=(12+15)/2=13.5; Q3=(42+50)/2=46; IQR=32.5. Upper fence=46+1.5(32.5)=46+48.75=94.75. Since 200>94.75, the value 200 is an outlier. The median (26.5) better represents the typical value because the mean (43.4) is inflated by the outlier.

29. A — Factor: $-x^2+8x-7=-(x^2-8x+7)=-(x-7)(x-1)$. Zeros: $x=7$ and $x=1$ — the profit is zero at 1 and 7 units. Axis of symmetry: $x=4$; vertex: $f(4)=-16+32-7=9$. Maximum profit of $900 (9 hundred dollars) occurs when 4 units are produced. Domain: $1\leq x\leq 7$ (positive profit only); Range: $0\leq f(x)\leq 9$ (in hundreds).

30. C — Build a table: x=0: f=1,g=1 ✓ (intersection at x=0); x=1: f=2,g=4 (g>f); x=2: f=4,g=7 (g>f); x=3: f=8,g=10 (g>f); x=4: f=16,g=13 (f>g). Second intersection between x=3 and x=4, approximately $x\approx3.8$. The two functions intersect at x=0 and $x\approx3.8$.

31. D — Factor numerator: $x^2+2x-15=(x+5)(x-3)$. Factor denominator: $x^2-9=(x-3)(x+3)$. Cancel $(x-3)$: result=$(x+5)/(x+3)$. Undefined when $x=3$ (cancelled) and $x=-3$. Both restrictions must be stated.

32. A — The two functions share the same zeros because $g(x)=(1/3)f(x)$ — they are scalar multiples of each other. At $x=2/3$ (zero of f): $f(2/3)=0$ and $g(2/3)=0$ ✓. However, $f(1)=1$ and $g(1)=1/3$ — different outputs for the same input. The functions are not equal; the student is wrong. Shared zeros alone do not define equal functions.

33. C — Table: Breakfast/Pass=96, Breakfast/Fail=24, Breakfast/Total=120; Skip/Pass=32, Skip/Fail=48, Skip/Total=80; Total/Pass=128, Total/Fail=72, Total=200. Conditional frequency for breakfast eaters: 96/120=80%. Conditional frequency for non-breakfast eaters: 32/80=40%. Strong association — breakfast eaters pass at exactly double the rate of non-breakfast eaters (80% vs. 40%), strongly suggesting a positive association between eating breakfast and quiz performance.

34. D — Steps 1 and 2 are correct: $f(x)=2x(x-5)(x+2)$. The error is in Step 3 — from $(x+2)$, the zero is $x=-2$, not $x=2$. The correct zeros are $x=0$, $x=5$, and $x=-2$. Step 4 is correct: odd degree (3) with positive leading coefficient → falls left (as $x\to-\infty$, $f\to-\infty$) and rises right (as $x\to+\infty$, $f\to+\infty$).

35. B — At $t=0$: $A(0)=120$ ✓; $B(0)=120$ ✓; $C(0)=120$ ✓. All agree at 120 individuals. Table (rounded): $t=0$: A=120, B=120, C=120; $t=3$: A=225, B=183, C=216; $t=5$: A=295, B=245, C=318; $t=8$: A=400, B=376, C=574; $t=10$: A=470, B=470, C=857; $t=15$: A=645, B=795, C=2,354. B vertex: axis$=-15/[2(2)]=-3.75$; since $t\geq0$ and $a=2>0$, the quadratic opens upward with its vertex at $t=-3.75$ (before the domain), so within the domain B is always increasing — there is no minimum in the observable range; Species B's population increases throughout. Species C first exceeds A: between $t=3$ ($C=216<A=225$) and $t=5$ ($C=318>A=295$) — approximately $t\approx4$. Species C first exceeds B: at $t=10$ they are equal (both≈470); by $t=15$ $C(2354)>B(795)$ — crossing occurs near $t=10$. At $t=15$: A=645 (smallest), B=795 (middle), C=2,354 (largest). The exponential model grows fastest because each year's increase is proportional to the current population — a larger population generates a larger absolute increase, creating compounding acceleration. Linear growth adds 35 each year regardless of size; quadratic growth accelerates due to the t^2 term; exponential growth multiplies by 1.22 each year, producing growth that compounds without limit.