College Algebra Sample Final

The final exam for Math 111 will contain items similar to these practice exams and review problems, although it is not limited to this material only. All items are in open-ended format. Partial credit may be given for imperfect answers.

Sixteen-problem practice exam: this is one possible selection only—these problems do not indicate the content of the final exam.

(1). Graph. Show each transformation. $f(x) = -|2x+6|+3$.

(2). Graph $f(x) = -3(x+2)^2+1$ or $f(x) = -3x^2-12x-11$.

(3). Graph $2y+3x-6=0$.

(4). Graph $y^2-8x-5+x^2+4y=0$.

(5). Graph $f(x) = -8(x+5)(x-3)(x+1)^2$.

(6). Find the inverse function. $f(x) = \frac{2-x}{x+4}$.

(7). Find the domain. $f(x) = \frac{\sqrt{3-x}}{x+4}$.

(8). Solve and graph. $-1 < -\frac{2}{3}x+3 \leq 7$.

(9). Solve. $\log_4(10-x) = 2-\log_4(-x-5)$.

(10). Solve. $y^4-3y^2+2=0$.

(11). The top of a ladder leans against a house at a height of 12 feet. The length of the ladder is 8 feet more than the distance from the house to the base of the ladder. Find the length of the ladder.

(12). Solve the system of equations. $x+3y=2,\ 2x-6y=0$.

(13). Evaluate. $\sum_{k=0}^{3}(k!-k^2)$

(14). Solve. $-3(x-1)+2x = 7(x-6)-3$.

(15). Solve. $\frac{2}{x-7} - \frac{6}{2x+2} = \frac{6}{x^2-6x-7}$.

(16). Find all zeros of the function $f(x) = x^3+x^2-20x$.

Twenty-five problem practice exam: this is one possible selection only—these problems do not indicate the content of the final exam.

(1). Graph. Show each transformation. $y = -\sqrt{x-3}+2$.

(2). Evaluate. $(3-2i)(3+2i)$.

(3). Find an equation of the line through the points $(1,4)$ and $(-2,6)$.

(4). Given that -3 is a root, find all the roots. $2x^3-14x+12=0$.

(5). Solve. $x^2-5x+6=0$.

(6). Solve. $\log_{49} x = 1/2$.

(7). Solve. $|x+3|-7=4$.

(8). Find the distance between the points $(1,3)$ and $(5,2)$.

(9). Find the maximum point of the function $B(x) = -7x^2+14x+30$.

(10). The intensity of the gravitational field varies directly as mass and inversely as distance squared. When the mass is 2 and distance is 4, the intensity is 6. Find the intensity when the distance is 2 and the mass is 4.

(11). Find the value of an investment of \$1,000 after 12 years, with an interest rate of 6% compounded semiannually. $A = P(1+r/n)^{nt}$.

(12). Simplify given that $h \neq 0$. $\frac{\frac{1}{x+h}-\frac{1}{x}}{h}$

(13). Find the interest rate necessary for an investment to double in value after 10 years, assuming that interest is compounded continuously. $A = Pe^{rt}$.

(14). Simplify. $\frac{(4x^3y^{4/3})^3}{16x^5yz^{-1}}$

(15). Rationalize the denominator. $\frac{1}{6-\sqrt{x}}$

(16). Graph. $y < x+1, 1 \leq x < 3$.

(17). Solve. $(x-2)^2 = 5$.

(18). Solve. Graph the solution. $|2x-1| \geq 2$.

(19). Find $(f \circ g)(x)$ for the given functions f and g. $f(x) = \frac{1}{1-x}$, $g(x) = 2x + 1$
(20). Graph. $y = -\frac{3}{2}x + 1$
(21). Solve. $2x^2 + 5x + 1 = 0$.
(22). Find the exact value of the logarithm. $\log_7 \sqrt{7^{3000}}$.
(23). Graph a line which has a slope of -3/4 and passes through the point (-1, 5).
(24). Problems involving radioactive decay use the formula $A = A_0(2)^{-t/h}$. If the half-life (h) of a substance is 14 years, how much of a 600-gram sample will remain in 42 years?
(25). A woman invests part of \$10,000 at 8% annual interest and the rest at 9%. Her annual income from these investments is \$830. How much did she invest at 9%?

The 48 practice problems illustrate some of the various college algebra concepts from which problems in the final exam are chosen.

(1). Find the inverse function f^{-1} for the function $f = \{(1,2), (5,3), (2,4)\}$. Give the domain and range of f and f^{-1}.
(2). Graph the functions showing two points and the correct shape for each. (a) $\log_3(x)$, (b) $2 - 3^x$
(3). Find the equation of the line through the points (1, 5) and (1, 14).
(4). If $f(x) = 1 - 3x$, find $f(2h - 1)$.
(5). Solve. $3^{-2x} = 9$.
(6). Solve. $3^{-2x} = e^{x+1}$.
(7). Solve. $5x^2 - 2 = -3x$.
(8). Solve. $x^2 + 3 = 0$.
(9). Solve. $\frac{3x}{5} - \frac{x-3}{2} = \frac{x+2}{3}$.
(10). Solve. $(4 - x)^{3/2} = 8$.
(11). Solve. $y^{2/3} - 5y^{1/3} + 4 = 0$.
(12). Solve. $x + \frac{3x+6}{x-3} = 5 + \frac{15}{x-3}$.
(13). Solve. $\sqrt{x+2} + \sqrt{3x+7} = 1$.
(14). Solve for h. $A = \frac{1}{2}w(2lc + 2lh + 2wh)$.
(15). Solve for w. $1 - \frac{1}{1-w} = \frac{1}{g}$.
(16). Divide. $\frac{-4-8i}{3-9i}$.
(17). How many gallons of 25% alcohol solution do you need to add to four gallons of 12.5% alchol in order to have a solution mixture that is one-sixth alcohol?
(18). Susan really wants to get a grade of 100% in her underwater basketweaving class. Her grade in the class fluctuates during the semester according to the function $G(w) = -0.1(w - 12)^2 + 101.6$. In the formula w is the week during the semester ($w = 1$ through 16). Does Susan accomplish her goal? What is her final grade? What is her highest grade during the semester, and in which week does it occur?
(19). Find all roots of the polynomial given that three is a root: $x^4 - 6x^3 - x^2 + 30x$.
(20). Divide. $\frac{2x^3+x^2-8x-4}{x-4}$.
(21). Find all the solutions of the equation $x^4 = 16$ by finding zeros of the function $f(x) = x^4 - 16$.
(22). Expand. $\ln \sqrt{\frac{(x^3+1)^4 a^5}{a^2 b^3}}$
(23). Write $\log_{17} 24$ using natural logarithms.
(24). Solve.

$$4x + 3y = 5$$
$$10y - 4x = \frac{11}{3}$$

(25). Solve.

$$\begin{cases} x + 3y + z &= 2 \\ 4x + 2z &= -2 \\ y + 2z &= -1 \end{cases}$$

(26). A woman walked north at a rate of 3 miles per hour and returned at a rate of 4 miles per hour. The round trip took 3.5 hours. How many miles did she walk?

(27). A student took four tests in algebra, improving 4 points on each test. Her final average was 88%. What did she make on the first test?

(28). An excursion boat takes 1.5 times as long to go 360 miles up a river than to return. If the boat cruises at 15 miles per hour in still water, what is the rate of the current?

(29). If one side of a triangle is one-third the perimeter, the second side is one-fifth the perimeter, and the third side is 7 meters, what is the perimeter of the triangle?

(30). A fish pond measuring 10 feet by 16 feet is surrounded by a walkway of uniform width. If the combined area of the pool and the walkway is 280 square feet, determine the width of the walkway.

(31). Find the equation of a circle given that P(5,7) and Q(-1, -1) are the endpoints of a diameter.

(32). Solve for x. $5^{x-2} = \left(\frac{1}{5}\right)^{3x+2}$.

(33). Simplify. $\frac{2\log x + \log y}{\log z}$

(34). Write the first four terms of the sequence with general term $a_n = \frac{(-1)^{n-1}}{2^n}$.

(35). Write the first four terms of the sequence given that the first term is 6 and the recursive formula is $a_n = 3a_{n-1} + 1$.

(36). Write a formula for the general term of the sequence: 200, 180, 160, ...

(37). For an arithmetic sequence, the n-th partial sum is $S_n = n(a_1 + a_n)/2$. Find the sum of the numbers 1 + 2 + 3 + ... + 99 + 100.

(38). A collection of dimes, nickels, and quarters has a value of \$3.55. There are twice as many dimes as quarters, and there are 29 coins in all. How many of each kind are there?

(39). The university tuition may go up 9% for next year. If the current rate was \$80 per credit hour, how much will it cost to enroll in 15 hours next year?

(40). Two boats start together. One travels north at 4 miles per hour and the other travels south at 3 miles per hour. How soon will the boats be 70 miles apart?

(41). Graph the function.

$$f(x) = \begin{cases} 1 - 2x, & x < 0 \\ 3x, & 0 \le x \le 3 \\ -1, & 3 < x \end{cases}$$

(42). Find the vertex, axis of symmetry, x-intercepts, and y-intercept of $f(x) = -x^2 - 6x + 12$.

(43). Simplify. $(-2i)^7 + i^{301} - i^4 - i^2$.

(44). Specify whether y is a function of x. (a) { (1, 1), (1, 1) }, (b) { (2, 1), (3, 1), (5, 1) }, (c) { (1, 2) }, (d) { (0, 1), (2, 3), (2, 1) }, (e) $x^2 + y^2 = 1$, (f) $y^2 = 0$, (g) $|y| = 1$, (h) $x = 3$, (i) $x^2 + y = 1$.

(45). Given that f is a one-to-one function $\sqrt[3]{\frac{x+1}{3x-4}}$ and 3 is in the domain of f, what is the value of $f^{-1}(f(3))$?

(46). Evaluate. $\log_6 72 - \log_6 2$.

(47). Evaluate. $\log 10^{10000.5}$.

(48). Write as a single logarithm. $\log_4(x^3 - 4x) - \log_4 x - \log_4(x - 2)$.