

MSLC – Math 1075
Final Exam Review

Disclaimer: This should NOT be used as your only guide for what to study.

1. Factor completely.

- a. $x^3y^2 + xy^2 - 5xy^3$
- b. $3m(9n-2) + 8(9n-2)$
- c. $-27x^3 + 18x^2 - 3x$
- d. $15x^2 + 10xy - 6x - 4y$
- e. $18xy - 4y^2 + 36x - 8y$
- f. $5z^2 + 12z + 7$
- g. $mn - 9m - n + 9$
- h. $63c^2 - 28d^2$
- i. $8m^3 + 125p^3$
- j. $9v^2 + 14v - 8$
- k. $x^2 + 2xy + y^2 - 16z^2$

2. Solve the absolute value equation algebraically.

- a. $|8x - 5| = 13$
- b. $|4x + 2| = |5x - 1|$
- c. $|7 - 2x| = 11$

3. Solve the following inequalities algebraically. Give your answers in interval notation.

- a. $5(1 - 2x) \leq 9(x - 3)$
- b. $-7 < 5x + 8 \leq 28$
- c. $|4x + 1| < 17$
- d. $|2x - 1| \geq 5$
- e. $-21 \leq 3(x + 2) < 18$
- f. $|7 + 2x| \leq 11$
- g. $|8x - 5| > 13$

4. Given set $A = [-5, 1]$ and set $B = (-1, 8]$ determine:

- a. $A \cup B$
- b. $A \cap B$

5. Graph the solution sets to the following system of linear inequalities.

- a. $x + 2y \leq 2$
 $2x - y > 4$
- b. $x \geq -1$
 $y \geq 3$

6. Solve by factoring:

a. $x^2 + 10x = -21$

b. $\frac{x^2}{18} + \frac{x}{6} - 1 = 0$

c. $(x+6)(x-2) = 9$

d. $5x^2 = 3x + 2$

7. Find the domain of each of the following functions. *Give your answer in interval notation.*

a. $g(x) = \sqrt{3(x-11)}$

b. $j(x) = \sqrt{3-2x}$

c. $k(x) = \sqrt[3]{x-7}$

8. The minimum charge for a taxi ride is \$3.50, plus \$0.25 per 0.1 mile. How many miles can you travel if you have at most \$30.25 to spend on taxi fare?

9. Use the square root property to find the exact answer to each of the following.

Make sure to completely simplify your answers.

a. $3n^2 - 150 = 0$

b. $70m^2 - 110 = 0$

c. $(2x-3)^2 = 169$

10. Use completing the square to find the exact answer of the following.

Make sure to completely simplify your answers.

a. $5p^2 + 30p + 20 = 0$

b. $(w-1)(w+4) = 7$

11. Use the quadratic formula to find the exact answer of the following.

Make sure to completely simplify your answers.

a. $9a^2 + 12a = -4$

b. $(b-1)(b+1) = 15$

12. Simplify the following powers of i .

a. i^{63}

b. i^{114}

c. i^{2680}

13. Two airplanes leave the same airport at the same time. One airplane flies due south, while the other flies due west 10 mph faster than the first plane. After 1 hour the airplanes are 290 miles apart. Find the speed of each airplane.

14. Reduce the following rational expressions into lowest terms.

a. $\frac{6m^2}{12m^4 - 18m^3}$
b. $\frac{x^2 - 2xy + y^2}{x^2 - y^2}$
c. $\frac{ax + bx - ay - by}{9x - 9y}$
d. $\frac{(c^2 - 2cd + d^2) - w^2}{5c - 10b + 5w}$

15. Perform the indicated operations and reduce the result into lowest terms.

Assume that the variables are restricted to values that prevent division by 0.

a. $\frac{12x+16}{(x-4)^2} \cdot \frac{2x-8}{3x+4}$ b. $\frac{8x+54}{x^2-81} - \frac{2x}{x^2-81}$
c. $\frac{11}{9x^3} - \frac{2}{x^6} \div \frac{9}{x^3}$ d. $\frac{\frac{7}{x} + \frac{35}{x^2}}{1 - \frac{25}{x^2}}$

16. Use the given functions $f(x) = x^3$, $g(x) = \sqrt{x-8}$, and $h(x) = \frac{1}{3x+7}$ to find each of the following:

a. $f(4)$ b. $g(33)$ c. $h(-6)$ d. $g(3m)$ e. $f(-5a^2)$
f. $(f-g)(9)$ g. $(g \cdot h)(17)$ h. $\left(\frac{f}{h}\right)(-7)$ i. $(g \circ f)(x)$ j. $(h \circ f)(-2)$

17. Write an equation for each of the variation statements given:

- A varies directly as B cubed
- m varies directly as the square root of n and inversely as the square of p
- y varies jointly as x and the cube root of z and inversely as the square root of w

18. The distance required for an emergency stop for a car varies directly as the square of the speed of the car.

A car travelling 50 miles per hour requires 140 feet to stop.

- What is the constant of variation?
- Write an equation relating the stopping distance to the speed of the car.
- How many feet will the car need to make an emergency stop if it is travelling at 70 miles per hour?
- How fast was the car travelling if it required 68.6 feet to make an emergency stop?

19. Perform the indicated operations. Make sure you completely simplify your answers.

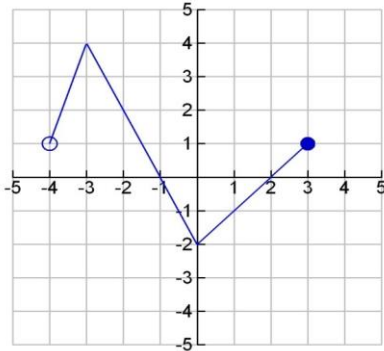
a. $4(3-2i) - i(5+3i)$
b. $(11-3i)(2+5i)$
c. $\frac{5-2i}{4+3i}$

20. Solve the following equations, *your answers may be complex*.

a. $x^2 + 25 = 0$

b. $x^2 = 4x - 6$

21. The graph below represents the graph of a function f .



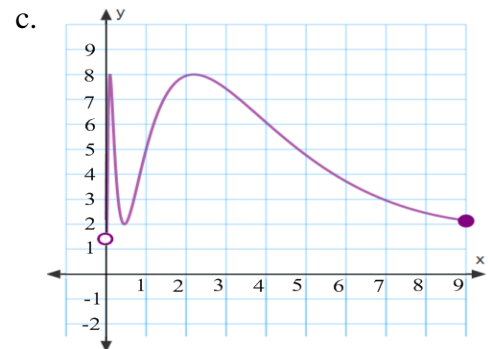
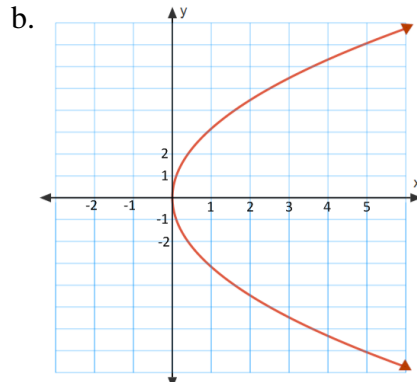
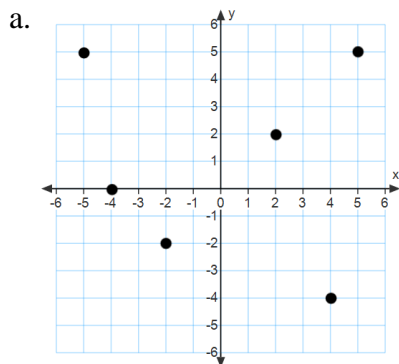
a. Evaluate $f(2)$.

b. Determine all values of x that produce $f(x) = 1$.

c. Determine the domain of f using interval notation.

d. Determine the range of f using interval notation.

22. Find the domain and range (in interval notation) of each of the following graphs of relations, and determine if that relation is also a function:



23. Given the quadratic function $q(x) = 5x^2 + 13x - 6$ find:

- the y -intercept
- the x -intercept(s)
- the vertex

24. The height of a softball being hit is given by the function $h(t) = -16t^2 + 48t + 8$ where h is the height of the ball (in feet) and t is the number of seconds after the ball has been hit.

- After how many seconds does the ball reach its maximum height?
- What is the ball's maximum height?
- How much time passes before the ball hits the ground?

Round your answer to the nearest hundredth of a second.

25. Solve the equation.

a. $\frac{5}{4a+1} = 1 + \frac{3}{8a+2}$

b. $\sqrt{16x-64} = x$

c. $\frac{n-3}{n^2+5n+4} + \frac{n-2}{n^2+3n+2} = \frac{n^2-12}{(n+1)(n+2)(n+4)}$

d. $\sqrt{2w+1} = w+1$

e. $\sqrt[3]{5y+2} = -3$

26. Perform the indicated operations and simplify. Rationalize denominators where appropriate.

a. $\sqrt[5]{4^3} \cdot \sqrt[5]{4^2}$

b. $\sqrt{18} + \sqrt{2}$

c. $\frac{10}{\sqrt{5}}$

d. $7\sqrt{x^3y} - x\sqrt{49xy}$

e. $\frac{15}{9-\sqrt{6}}$

f. $(\sqrt[3]{-4v})(\sqrt[3]{2v^2})$

27. Solve the equations below for b .

a. $\frac{b+r}{w+1} = \frac{4}{w-5}$

b. $\frac{c}{b-3} = \frac{4}{a+5}$

28. Simplify the following using only positive exponents in your answers. Assume all variables represent positive real numbers.

a. $\left(4^{\frac{1}{5}} \cdot 4^{\frac{2}{5}}\right)^{\frac{5}{2}}$

b. $\frac{y^{\frac{1}{4}}}{y^{\frac{1}{5}}}$

c. $\frac{w^{\frac{3}{4}}}{w^{-\frac{3}{8}}}$

d. $\left(25v^{-\frac{4}{9}}\right)^{\frac{3}{2}}$

e. $\left(\frac{27n^{\frac{3}{5}}}{n^{-\frac{3}{5}}}\right)^{-\frac{2}{3}}$

f. $\frac{(5xy^2z^2)^{\frac{1}{3}}(25x^2y^3z)^{\frac{1}{3}}}{3x^2y^{-\frac{1}{3}}z^{-2}}$

ANSWERS

1. a. $xy^2(x^2+1-5y)$ b. $(9n-2)(3m+8)$ c. $-3x(3x-1)^2$ d. $(3x+2y)(5x-2)$

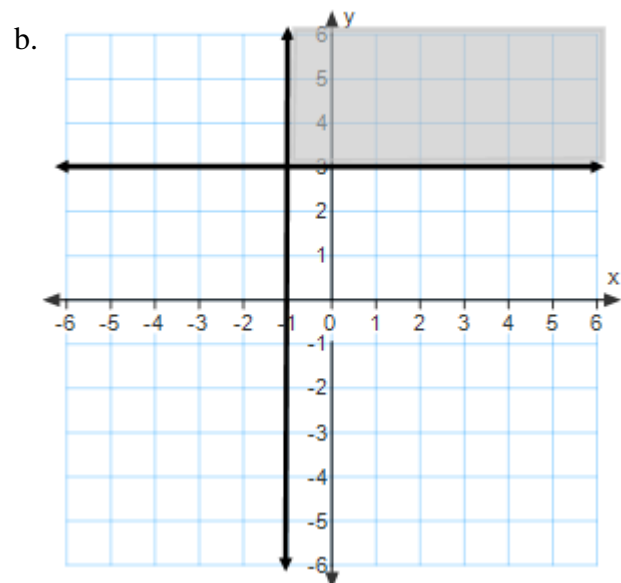
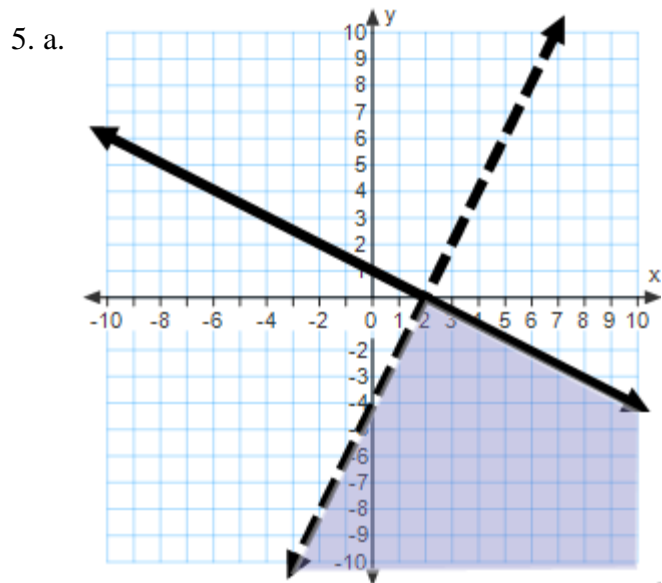
e. $2(y+2)(9x-2y)$ f. $(5z+7)(z+1)$ g. $(n-9)(m-1)$ h. $7(3c+2d)(3c-2d)$

i. $(2m+5p)(4m^2-10mp+25p^2)$ j. $(9v-4)(v+2)$ k. $(x+y+4z)(x+y-4z)$

2. a. $x = -1$ or $x = \frac{9}{4}$ b. $x = -\frac{1}{9}$ or $x = 3$ c. $x = -2$ or $x = 9$

3. a. $\left[\frac{32}{19}, \infty\right)$ b. $(-3, 4]$ c. $\left(-\frac{9}{2}, 4\right)$ d. $(-\infty, -2] \cup [3, \infty)$
 e. $[-9, 4)$ f. $[-9, 2]$ g. $(-\infty, -1) \cup \left(\frac{9}{4}, \infty\right)$

4. a. $[-5, 8]$ b. $(-1, 1]$



6. a. $x = -7$ or $x = -3$ b. $x = -6$ or $x = 3$
 c. $x = -7$ or $x = 3$ d. $x = -\frac{2}{5}$ or $x = 1$

7. a. $[11, \infty)$ b. $(-\infty, \frac{3}{2}]$ c. $(-\infty, \infty)$

8. 10.7 miles

9. a. $n = \pm 5\sqrt{2}$ b. $m = \pm \frac{\sqrt{77}}{7}$ c. $x = -5$ or $x = 8$

10. a. $p = -3 + \sqrt{5}$ or $p = -3 - \sqrt{5}$ b. $w = \frac{-3 + \sqrt{53}}{2}$ or $w = \frac{-3 - \sqrt{53}}{2}$

11. a. $a = -\frac{2}{3}$ b. $b = -4$ or $b = 4$

12. a. $-i$ b. -1 c. 1

13. The southbound airplane is travelling at 200 mph; the eastbound airplane's speed is 210 mph

14. a. $\frac{1}{2m^2 - 3m}$ b. $\frac{x - y}{x + y}$ c. $\frac{a + b}{9}$ d. $\frac{(c - d - w)(c - d + w)}{5(c - 2b + w)}$

15. a. $\frac{8}{x-4}$ b. $\frac{6}{x-9}$ c. $\frac{1}{x^3}$ d. $\frac{7}{x-5}$

16. a. 64 b. 5 c. $-\frac{1}{11}$ d. $\sqrt{3m-8}$ e. $-125a^6$ f. 728 g. $\frac{3}{58}$ h. 4802 i. $\sqrt{x^3-8}$ j. $-\frac{1}{17}$

17. a. $A=kB^3$ b. $m=\frac{k\sqrt{n}}{p^2}$ c. $y=\frac{kx\sqrt[3]{z}}{\sqrt{w}}$

18. a. $\frac{7}{125}$ or 0.056 b. $D=.056v^2$ c. 274.4 feet d. 35 mph

19. a. $15-13i$ b. $37+49i$ c. $\frac{14}{25}-\frac{23}{25}i$

20. a. $x=5i$ or $x=-5i$ b. $x=2+i\sqrt{2}$ or $x=2-i\sqrt{2}$

21. a. $f(2)=0$ b. $x=-1.5$ or $x=3$ (The function doesn't include $x=-4$)
 c. D: $(-4,3]$ d. R: $[-2,4]$

22. a. Domain: $\{-5,-4,-2,2,4,5\}$ b. Domain: $[0,\infty)$ c. Domain: $(0,9]$
 Range: $\{-4,-2,0,2,5\}$ Range: $(-\infty,\infty)$ Range: $(1.5,8]$
 It's a function Not a function It's a function

23. a. $(0,-6)$ b. $(\frac{2}{5},0);(-3,0)$ c. $(-\frac{13}{10},-\frac{289}{20})$

24. a. 1.5 seconds b. 44 feet c. 3.16 seconds

25. a. $a=\frac{5}{8}$ b. $x=8$ c. $n=1$ d. $w=0$ e. $y=-\frac{29}{5}$

26. a. 4 b. $4\sqrt{2}$ c. $2\sqrt{5}$ d. 0 e. $\frac{9+\sqrt{6}}{5}$ f. $-2v$

27. a. $b=\frac{4(w+1)}{w-5}-r$ or $b=\frac{4w+4-rw+5r}{w-5}$ (equivalent answers)

b. $b=\frac{c(a+5)}{4}+3$ or $b=\frac{ac+5c+12}{4}$ (equivalent answers)

28. a. $4^{\frac{3}{2}}$ b. $y^{\frac{1}{20}}$ c. $w^{\frac{9}{8}}$ d. $\frac{125}{v^{\frac{2}{3}}}$ e. $\frac{1}{9n^{\frac{4}{5}}}$ f. $\frac{5y^2z^3}{3x}$