Math 026
Review Exercises for the Final Exam

The following are review exercises for the Math 026 final exam. These exercises are provided for you to practice or test yourself for readiness for the final exam. There are many more problems appearing here than would be on the final. These exercises represent many of the types of problems you would be expected to solve on the final, but are not meant to represent all possible types of problems that could appear on the final exam. Note for the final exam you must show **all** your work in order to receive full credit. Scientific calculators are permitted: graphing calculators or calculators with QWERTY keyboards are NOT permitted. Word problems must be done using algebraic methods to receive full credit.

1. Solve the following equations:

a) $3x-2(2x+3)=5-[2x-3(4-x)]$
b) $3x-2(2x+3)=5x-[2x-(7-4x)]$
c) $|5x-1|=9$
d) $|3x-2|+8=6$
e) $\frac{3}{2}|2x-5|-2=7$
f) $|3x+5|=|2x-1|$

2. Solve the following inequalities: express your answer *using interval notation* and graph the solution on the real number line.

a) $2-x\le 3-(5x-4)$
b) $-5<\frac{1}{4}(x-4)-2(4-x)$
c) $-7<2-3x\le 5$
d) $|3x-4|\le 6$
e) $|5-2x|>3$

3. Cathy makes two different types of candy: truffles and jellybeans. She charges $9 a box for the truffles and $6 a box for the jellybeans. If she decides to make 28 boxes of candy one day, what is the minimum number of boxes of truffles she should make if she is to gross at least $216? [Only algebraic solutions will receive credit.]

4. Jake can complete a job in 5 hours while Jerry can complete the same job in 3 hours.
a) How long would it take to complete the job if both Jerry and Jake worked together?
b) How long would it take to complete the job if Jake starts the job two hours before Jerry joins him?

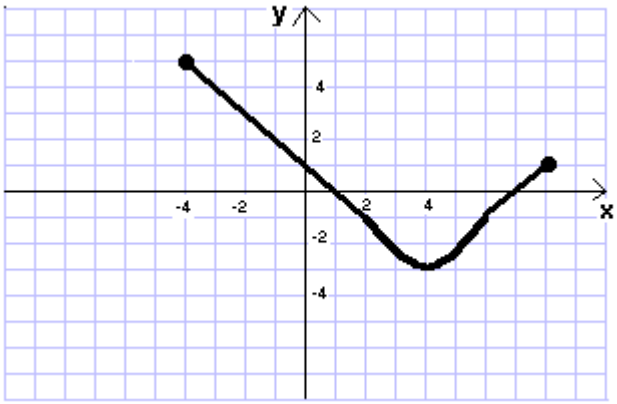
5. How long will it take someone running at 12 mph to catch up to someone walking at 5 mph with an hour and a half head start?

6. Given $f(x) = 3x^2 - 5x + 4,\ g(x) = \dfrac{3x}{x-2}$, and $h(x) = \sqrt{2-x}$, find

a) $f(3),\ f(-3), g(2), g(-2), h(1), h(4)$

b) $f(x-1), g(x+h), h(x+2)$

7. Use the graph of $y = f(x)$ below to answer the following questions:



a) Find $f(-1)$.

b) Find x such that $f(x) = 0$.

c) What is the domain of this function?

d) Which is larger: $f(-2)$ or $f(2)$?

e) What is $f(4) - f(-1)$?

8. If $f(x) = 2x - 3$ and $g(x) = 4x^2 + 6x + 9$, find and simplify $f(x) \cdot g(x)$.

9. If $f(x) = x^2 - 3x + 5$ and $g(x) = \dfrac{5}{x-2}$, find and simplify:

a) $\dfrac{f(x+h) - f(x)}{h}$

b) $\dfrac{g(x+h) - g(x)}{h}$

10. Find the equation of the following lines: express your answer in slope-intercept form.

a) The line passing through (-2,5) and (4,9).

b) The equation of the line that passes through the point (-2,3) and is parallel to the line $5x + 3y = 12$.

c) The equation of the line that passes through the point (-2,3) and is perpendicular to the line $5x + 3y = 12$

d) The equation of the line with x-intercept 5 and y-intercept –2.

11. When soft drinks sold for $0.80 per can at football games, approximately 6500 cans were sold. When the price was raised to $1.00 a can, the demand dropped to 4000. Assume that the relationship between the price p and the demand y is linear.

a) Write a linear function giving the demand y as a function of p.
b) Use this function to estimate the number of cans sold if the price is raised to $1.05.

12. Solve the following systems:

a) $\begin{cases} 6x + 5y = 12 \\ 4x + 3y = 7 \end{cases}$

b) $\begin{cases} \dfrac{x}{2} - 2y = -8 \\ 3x + \dfrac{2}{3}y = -10 \end{cases}$

c) $\begin{cases} 9x - 6y = 4 \\ 6x - 4y = 5 \end{cases}$

13. Sketch a graph of the following inequalities:

a) $3x - 7y < 21$

b) $5x + 4y \geq 10$

14. Factor the following completely (if possible):

a) $5x^2 - 7x + 6$

b) $8x^3y - 50xy^3$

c) $5x(x+2)+7(x+2)$

d) $(a - b)^2 - 64$

e) $x^3 - x - x^2 + 1$

15. Perform the following long division:

a) $(2x^3 - 3x^2 + x + 1) \div (x + 2)$

b) $\dfrac{4x^3 - 3x - 7}{2x - 1}$

16. Solve for x by factoring:

a) $6x^2 - 19x = -10$

b) $x(2x - 3) = x^2 + 10$

c) $(x + 3)(x - 1) = (2x + 3)(x + 5)$

17. Perform the operations and express your answer in simplest form.

a) $\dfrac{4}{2x^2+3x}-\dfrac{2x-5}{6x+9}$

b) $\dfrac{2x^2}{x^2-10x+25}-\dfrac{x+5}{x-5}$

c) $\dfrac{3}{x^2-5x+6}-\dfrac{x+5}{x^2-4}$

18. Express the following as a fraction in simplest form:

a) $\dfrac{1-\dfrac{1}{x^2}}{\dfrac{x-1}{x}}$

b) $\dfrac{\dfrac{4}{n}+\dfrac{4}{m}}{\dfrac{16}{m^2}-\dfrac{16}{n^2}}$

c) $\dfrac{1+\dfrac{1}{x^2-1}}{\dfrac{1}{x}-\dfrac{x}{x+1}}$

19. Solve for x:

a) $\dfrac{4}{x-5}-\dfrac{10}{x}=\dfrac{5}{x-5}$

b) $\dfrac{5}{x-1}-\dfrac{7}{x}=\dfrac{3}{2x-2}$

20. Solve explicitly for x:

a) $3x + 2y - 5 = ax + by + 1$

b) $y = \dfrac{3x - 5}{x + 7}$

21. Perform the operations and simplify the following. *Express your answers with positive exponents only.*

a) $(-2x^2y^3)(3x^3y^4)^2$

b) $\dfrac{(-2a^3b^2)^3}{(6a^3b^2)^2}$

22. Perform the operations and simplify the following. *Express your answers with positive exponents only.*

a) $(-3a^{-2}b^4)(2a^3b^{-6})^{-2}$

b) $\left(\dfrac{(3x^{-3}y^2)^{-3}}{-6x^3y^{-4}}\right)^{-2}$

23. Evaluate the following:

a) $\dfrac{3}{27^{2/3}}$

b) $(-32)^{-3/5}$

24. Perform the operations and simplify the following. *Express your answers with positive exponents only.*

a) $(8a^{-6}b^4)^{1/3}(2a^3b^{-2/3})$

b) $\left(\dfrac{(x^{-1/3}y^{1/2})^{-3}}{x^{1/2}y^{-4}}\right)^{-2}$

c) $\left(\dfrac{x^4 y^{\frac{-8}{3}}}{16x^{-6} y^{\frac{2}{3}}} \right)^{-1/2}$

25. Convert the following into scientific notation and then perform the computations. Show all work to get full credit. Express your answer using scientific notation.

$$\frac{(1{,}200{,}000)(0.0004)}{0.00005}$$

26. The speed of light is approximately 1.86×10^5 miles per second. If the planet Pluto is 3.67×10^9 miles from the sun, how long does it take light from the sun to reach Pluto? Express your answer using scientific notation.

27. Write the following in simplest radical form:

a) $2\sqrt{200} - \sqrt{98}$

b) $\sqrt{32x^3} - x\sqrt{8x} + 2\sqrt{25}$

c) $\sqrt[3]{8x^4} - 2x\sqrt[3]{x} + x\sqrt[3]{16x^5}$

28. Write the following in simplest radical form:

a) $\sqrt[3]{\dfrac{2}{3x^2 y}}$

b) $\dfrac{6\sqrt{2}}{\sqrt{6} - 2}$

29. Solve the following for *x*.

a) $\sqrt{x-3} + 5 = x$

b) $\sqrt{2x+3} - \sqrt{x+1} = 1$

c) $(3x+2)^{1/5} = 2$

d) $\sqrt[3]{2x+1}-2=3$

30. Solve the following equations: *express your answer in simplest form.*

a) $x^2-2x=5$

b) $(x-4)(2x+3)=x^2-4$

31. Find the domain of the following functions, expressing your answer in interval notation

a) $f(x)=\dfrac{3x-1}{x+4}$

b) $g(x)=\frac{1}{x^2-x-12}$

c) $h(x)=\sqrt{x-4}$

32. Given the point (1,7) and the point (-4, 3), determine the midpoint between the two points.

33. Sketch a graph the following functions: Identify the *x*-intercept(s), *y*-intercept, axis of symmetry, and vertex.

a) $f(x)=x^2-6x+8$

b) $g(x)=-x^2+10x-16$

34. Find the length of a diagonal of a square with side 6".

35. Alex throws a ball straight up into the air. The equation $s = s(t) = -16t^2 + 80t + 44$ gives the distance *s* (in feet) the ball is above the ground *t* seconds after he throws it.

a) How high is the ball two seconds after he throws it?

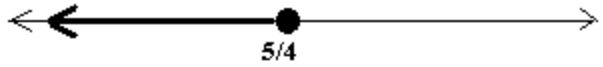
b) What is the maximum height of the ball from the ground?

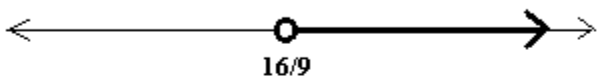
c) At what time does the ball hit the ground?

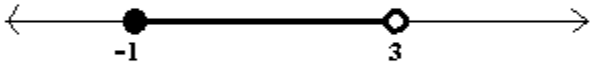
ANSWERS: MATH 026 FINAL EXAM REVIEW EXERCISES

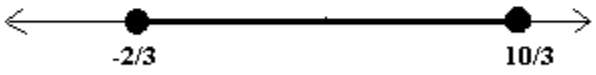
1. a) $x = \frac{23}{4}$ **b)** No Solution **c)** $x = -\frac{8}{5}, 2$ **d)** No Solution e) $x = -\frac{1}{2}, \frac{11}{2}$

f) $x = -6, -\frac{4}{5}$

2. a) $\left(-\infty, \frac{5}{4}\right]$ 

b) $\left(\frac{16}{9}, \infty\right)$ 

c) $[-1, 3)$ 

d) $\left[-\frac{2}{3}, \frac{10}{3}\right]$ 

e) $(-\infty, 1) \cup (4, \infty)$

3. At least 16 boxes of truffles. **4. a)** $1\frac{7}{8}$ hrs. **b)** $3\frac{1}{8}$ hours from the time Jake starts (or $1\frac{1}{8}$ hrs. from the time Jerry starts). **5.** $1\frac{1}{14}$ hrs. **6. a)** $f(3) = 16$, $f(-3) = 46$, $g(2)$ is undefined, $g(-2) = 3/2$, $h(1) = 1$, $h(4)$ is not a real number (4 is not in the domain of $h(x)$). **b)** $f(x-1) = 3x^2 - 11x + 12$, $g(x+h) = \frac{3x+3h}{x+h-2}$, $h(x+2) = \sqrt{-x}$

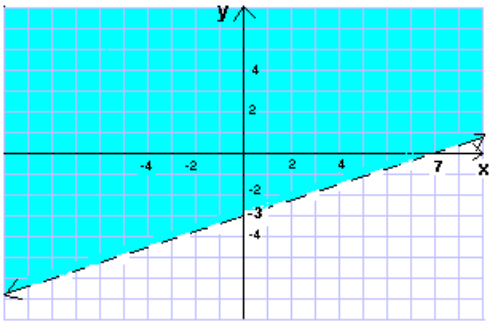
7. a) 2 **b)** $x = 1, 7$ **c)** $-4 \le x \le 8$ **d)** $f(-2)$ **e)** –5 **8.** $8x^3 - 27$

9. a) $2x + h - 3$ **b)** $-\frac{5}{(x+h-2)(x-2)}$ **10. a)** $y = \frac{2}{3}x + \frac{19}{3}$ **b)** $y = -\frac{5}{3}x - \frac{1}{3}$

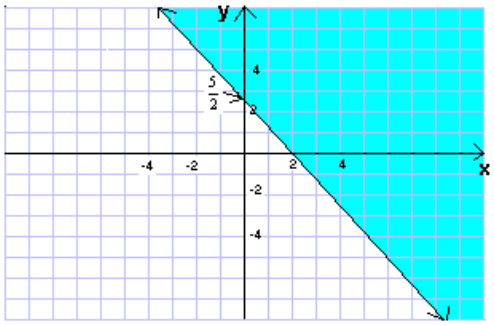
c) $y = \frac{3}{5}x + \frac{21}{5}$ **d)** $y = \frac{2}{5}x - 2$ **11. a)** $y = -12500p + 16500$ **b)** 3375

12. a) $x=-\frac{1}{2}, y=3$ **b)** $(-4,3)$ **c)** inconsistent

13. a)



b)



14. a) Not factorable **b)** $2xy(2x-5y)(2x+5y)$ **c)** $(5x+7)(x+2)$

d) $(a-b-8)(a-b+8)$ **e)** $(x-1)^2(x+1)$ **15. a)** $2x^2-7x+15 \quad R \quad -29$

b) $2x^2+x-1 \quad R \quad -8$ **16. a)** $x=\frac{2}{3},\frac{5}{2}$ **b)** $x=-2,5$ **c)** $x=-9,-2$

17. a) $\frac{4-x}{3x}$ **b)** $\frac{x^2+25}{x^2-10x+25}$ **c)** $\frac{-x^2+x+21}{(x-2)(x+2)(x-3)}$ **18. a)** $\frac{x+1}{x}$ **b)** $\frac{mn}{4(n-m)}$

c) $\frac{x^3}{-x^3+2x^2-1}$ **19. a)** $x=\frac{50}{11}$ **b)** $x=2$ **20. a)** $x=\frac{6+by-2y}{3-a}$ **b)** $x=\frac{-7y-5}{y-3}$

21. a) $-18x^8y^{11}$ **b)** $-\frac{2a^3b^2}{9}$ **22. a)** $-\frac{3b^{16}}{4a^8}$ **b)** $\frac{2^2 3^8 y^4}{x^{12}}$ **23. a)** $\frac{1}{3}$ **b)** $-\frac{1}{8}$

24. a) $4ab^{2/3}$ **b)** $\frac{1}{xy^5}$ **c)** $\frac{4y^{5/3}}{x^5}$ **25.** $\frac{(1.2\times10^6)(4\times10^{-4})}{5\times10^{-5}}=9.6\times10^6$

26. 1.9731×10^4 seconds or 5.48 hours. **27. a)** $13\sqrt{2}$ **b)** $2x\sqrt{2x}+10$ **c)** $2x^2\sqrt[3]{2x^2}$

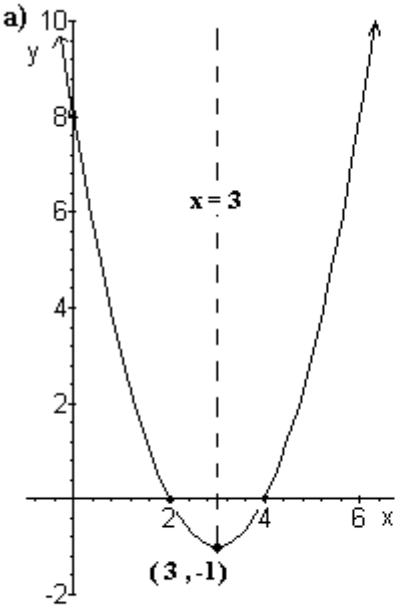
28. a) $\frac{\sqrt[3]{18xy^2}}{3xy}$ **b)** $6\sqrt{3}+6\sqrt{2}$ **29. a)** $x=7$ (4 is extraneous) **b)** $x=-1,3$

c) $x=10$ **d)** $x=62$ **30. a)** $x=1\pm\sqrt{6}$ **b)** $x=\frac{5\pm\sqrt{57}}{2}$

31. a) $(-\infty,-4)\cup(-4,\infty)$ **b)** $(-\infty,-3)\cup(-3,4)\cup(4,\infty)$ **c)** $[4,\infty)$

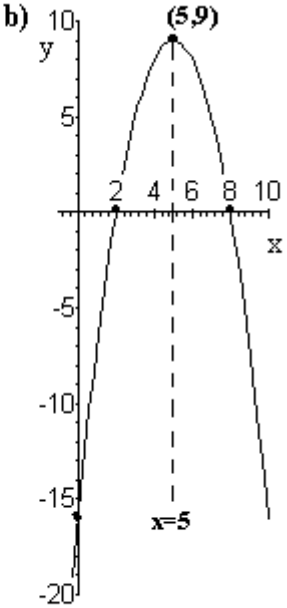
32. $(-\frac{3}{2}, 5)$

33. a)



y-intercept = 8: x-intercepts = 2, 4
Axis: x = 3: vertex = (3 , -1)

b)



y-intercept = -16: x-intercepts = 2 , 8
Axis: x=5 : vertex = (5,9)

34. $6\sqrt{2}$ inches **35. a)** 140 feet **b)** 144 feet **c)** $5\frac{1}{2}$ sec.