West Los Angeles College

Department of Mathematics

Department Final
For
Math 115: Elementary Algebra
(and Math 118: Elementary Algebra II)

Fall 2008, Version 3

40 Multiple-Choice Questions, 2 hours
Calculator Allowed

$\frac{120 \text{ min}}{40 \text{ q}} = \frac{3 \text{ min}}{\text{question}}$

Note:

- In the real Final, you will be provided scratch papers, yet you are NOT allowed to write on the Exam paper. In this review, however, the Final is retyped and the work will be done on the same page. You will need to adjust your way of doing the actual Final.
- Even calculator is allowed in the real test, the work shown here will be done without calculator.
- This is the WLAC Department Final for Fall 2008. While the underlying concepts are expected to be similar, Department Final for other semesters may look significantly different. For that reason, do not study based on this Review only.
- On the Final day, you need to bring your Student ID, your own scantron (long form), pencils, eraser, and calculator. Bring more than one pencils and sharpen them before the Final is started. Borrowing stationary during the Final is strongly prohibited.
- Turn off your cellphone, put it into your bag. DO NOT access your bag (and therefore your cellphone either) until you are outside the classroom.

1. Victor correctly answered 38 questions on a 40-question math test. Which percent did Victor get correctly?

   a. 45%
   (c.) 95%
   b. 61%
   d. 46%

$\frac{38}{40_2} \times \frac{100\%^{5}}{1} = 19 \times 5\% = 95\%$

$\frac{38}{40} = \frac{19}{20_1} \times \frac{100\%^{5}}{1} = 95\%$

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2. Solve: $5 = 3(x-2)+3-2x$

   a. 10
   c. 4
   b. 14
   (d.) 8

$5 = 3(x-2)+3-2x$
$5 = 3x-6+3-2x$
$5 = x-3$
$5+3 = x$
$8 = x$

---

3. Lawn ornaments may be rented at a rate determined by the formula $C = 2.9n + 1.7$, where C is the cost in dollars and n is the number of ornaments. Find the cost of renting 18 horse ornaments for a party.

   (a.) $53.90
   c. $52.20
   b. $50.50
   d. $57.13

$C = 2.9(18) + 1.7$
$C = 52.2 + 1.7$
$C = 53.90$

$\overset{7}{2.9} \times 18 = 232 + 29 = 52.2$

$52.2 + 1.7 = 53.9$

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4. A stamp collector has 8-cent stamps and 15-cent stamps. The number of 8-cent stamps is six less than four times the number of 15-cent stamps. The total value of the stamps is $1.40. find the number of both types of stamps in the collection.

   a. 8-cent stamps: 10; 15-cent stamps: 4
   b. 8-cent stamps: 10; 15-cent stamps: 3
   c. 8-cent stamps: 22; 15-cent stamps: 4
   d. 8-cent stamps: 4; 15-cent stamps: 10

$1.40 = 140 ¢

---

Let $x$ is the number of 15-cents stamps

⟹ the number of 8-cent stamps is $4x-6$

| Stamps | Number | Value (each) | Value (total) |
|---|---|---|---|
| 15-cent | $x$ | 15 | $15x$ |
| 8-cent | $4x-6$ | 8 | $8(4x-6)$ |

$140 = 15x + 8(4x-6)$

$140 = 15x+8(4x-6)$

$140 = 15x+32x-48$

$140 = 47x-48$

$140+48 = 47x$

$188 = 47x$

$\frac{188}{47} = x$

$4 = x$

$4x-6 = 4\cdot4-6$

$= 16-6$

$= 10$

$47 \times 4 = 188$

There are 4 15-cent stamps and 10 8-cent stamps

5. An investor placed a total of $20,000 in two simple interest accounts. One account earned a simple interest rate of 5.9%, and the other earned a simple interest rate of 4.6%. The two accounts earned a total of $946. How much was invested in each account?

a. $2000 at 5.9%; $18,000 at 4.6%

b. $8852 at 5.9%; $11,148 at 4.6%

c. $8671.81 at 5.9%; $11,328.19 at 4.6%

d. $18,000 at 5.9%; $2000 at 4.6%

---

a) let $x$ be the amount invested in 5.9%-account
(in the 4.6%-account : $20000 - x$).

b)

| Type | Invest | Rate | Interest |
|---|---|---|---|
| 5.9%-acc | $x$ | 0.059 | $0.059x$ |
| 4.6%-acc | $20000-x$ | 0.046 | $0.046(20000-x)$ |
| | 20000 | | $946 = 0.059x + 0.046(20000-x)$ |

c) $946 = 0.059x + 0.046(20000-x)$

$946 = 0.059x + 920 - 0.046x$

$946 = 0.013x + 920$

$946 - 920 = 0.013x$

$26 = 0.013x$

$\frac{26}{0.013} = x$

$\frac{26000}{13} = x$

$2000 = x$

$0.046 \times 20000$
$= 46 \times 20$
$= 920$

d) So, the amount invested in 5.9%-account is $2000.

6. How much pure water must be mixed with 6 pints of 70% developer to produce a mixture that is 40% developer?

a. $4\frac{13}{20}$ pt

(b.) $4\frac{1}{2}$ pt

c. $10\frac{1}{2}$ pt

d. $10\frac{7}{20}$ pt

1) let $x$ be the amount of pure water

2)

| Type | Amount | Conc | Developer |
|---|---|---|---|
| Pure | $x$ | 0 | 0 |
| 70%-dev | 6 | 0.7 | 4.2 |
| 40%-dev | $x+6$ | 0.4 | $0.4(x+6) = 4.2$ |

3) $0.4(x+6) = 4.2$

$0.4x + 2.4 = 4.2$

$0.4x = 4.2 - 2.4$

$0.4x = 1.8$

$x = \frac{1.8}{0.4}$

$x = \frac{18}{4}$

$x = \frac{9}{2} = 4\frac{1}{2}$ pt.

4) So, the amount of pure water is $4\frac{1}{2}$ pt

---

7. Solve: $x-4+(x+6)>0$

(a.) $x>-1$

b. $x<-1$

c. $x>1$

d. $x<1$

$x-4+x+6>0$

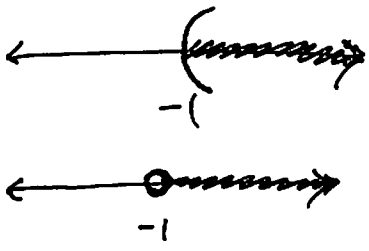
$2x+2>0$

$2x>0-2$

$2x>-2$

$x>\frac{-2}{2}$

$x>-1$

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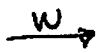
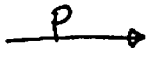
8. A plane flies 900 miles, with a tail wind, in 3 hours. It takes the same plane 4 hours to fly the 900 miles when flying against the wind. What is the plane's speed in still air?




(a.) 262.5 mph
b. 300 mph
c. 281 mph
d. 37.5mph

(1)  900 mi, 3 hr — rate: p+w


(2)  900 mi, 4 hr — rate: p−w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1) Let p be the speed of the plane in still air
w is the rate of the wind

2)

| Direction | Time | Rate | Distance |
|---|---|---|---|
| Tailwind | 3 | p+w | 900 |
| Headwind | 4 | p−w | 900 |

$\begin{cases} 3(p+w) = 900 \\ 4(p-w) = 900 \end{cases}$

3) $\begin{cases} 3(p+w) = 900 \\ 4(p-w) = 900 \end{cases} \Rightarrow \begin{cases} p+w = 300 \\ p-w = 225 \end{cases}$ +

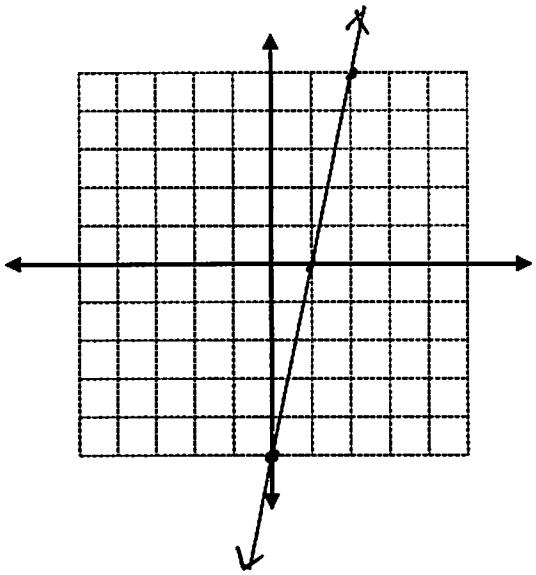
$2p = 525$

$p = \frac{525}{2}$

$p = 262.5$

4) So, the speed of the plane in still air is 262.5 mph.

9. Which is the graph of $y = 5x - 5$?



$y = 5x - 5$
$m = 5$
y-int $(0,-5)$

---

$y = 5x - 5$
y-int $(0,-5)$
x-int: $\rightarrow y = 0$
$0 = 5x - 5$
$5 = 5x$
$1 = x$
x-int $(1,0)$

---

10. Find the slope of the line that contains (8,6) and (6,-5)

$P_1$ $P_2$

a. $\frac{1}{4}$

(c.) $\frac{11}{2}$

b. 4

d. $\frac{2}{11}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{-5-6}{6-8}$

$m = \frac{-11}{-2}$

$m = \frac{11}{2}$

BONUS

$y = \frac{11}{2}x + b$

$(8,6) \rightarrow 6 = \frac{11}{2}(8) + b$

$6 = 44 + b$

$6 - 44 = b$

$-38 = b$

$\Longrightarrow y = \frac{11}{2}x - 38$

---

11. Which shows the equation of a line, in slope-intercept form, that passes through the point (-5,-3) and has slope 3?

(a.) $y = 3x + 12$

b. $y = -3x + 12$ ✗

c. $y = -3x - 12$ ✗

d. $y = 3x - 12$

$y = 3x + b$

$(-5,-3) \rightarrow -3 = 3(-5) + b$

$-3 = -15 + b$

$-3 + 15 = b$

$12 = b$

$\Longrightarrow y = 3x + 12$

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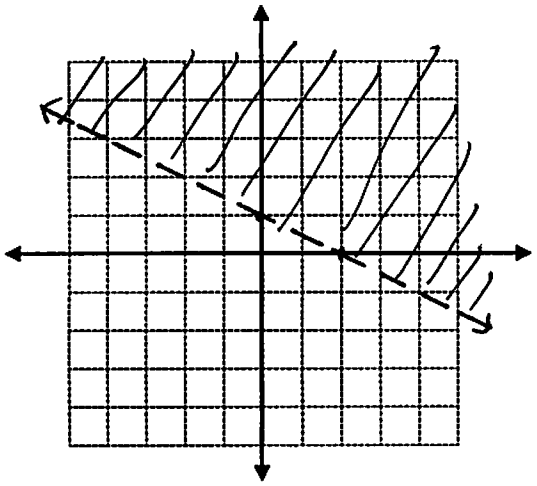
12. Graph: $x+2y>2$ ← dashes broken line.



① Boundary
$x+2y=2$
x-int (2,0)
y-int (0,1)

② Test (0,0)
$x+2y>2$
(0,0) → $0+2(0)>2$ ?
$0>2$ ✗
Shade the region NOT containing (0,0)

③ $>$ ← dashes

$x+2y>2$
$2y>-x+2$
$y>-\frac{1}{2}x+1$
$m=-\frac{1}{2}$, y-int (0,1)

---

13. Solve by addition method: $\begin{cases}4x+3y=10\\ x-3y=10\end{cases}$

$5x = 20$ + → $x=4$

a. (26,-2)
b. (4,-2)
c. (0,10/3)
d. No solution

② → $x-3y=10$
$4-3y=10$
$-3y=10-4$
$-3y=6$
$y=-2$

(4,-2)

---

14. Solve by substitution: $\begin{cases}y=x-2\\ y=2x\end{cases}$ → $2x=x-2$
$2x-x=-2$
$x=-2$

a. (1,-1)
b. (-1,-2)
c. (2,1)
d. (-2,-4)

② → $y=2x$
$y=2(-2)$
$y=-4$

(-2,-4)

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15. A clothing manufacturer purchased 60 yards of cotton and 90 yards of wool for a total of \$1800. Another purchase, at the same prices, included 80 yards of cotton and 20 yards of wool for a total cost of \$1000. Find the cost per yard of the cotton.

a. \$14 per yard
b. \$10 per yard
c. \$9 per yard
d. \$16 per yard

1) let $c$ be the cost per yard of cotton and $w$ be the cost per yard of wool

2) $\begin{cases} 60c + 90w = 1800 & \times 2 \\ 80c + 20w = 1000 & \times (-9) \end{cases}$

3) $\begin{cases} 120c + 180w = 3600 \\ -720c - 180w = -9000 \end{cases}$ +

$-600c = -5400$

$c = \frac{-5400}{-600}$

$c = 9$

4) So, the cost per yard of the cotton is \$9

16. Simplify: $(8x^3+9x-7)-(3x^3+7x-9)$

$8x^3+9x-7-3x^3-7x+9$

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

a. $11x^3+2x+2$

b. $5x^6+2x^2+2$

c. $11x^3+16x-16$

(d.) $5x^3+2x+2$

---

17. Simplify: $(-4t^3u^2p)^4$ $= \oplus 256t^{12}u^8p^4$

$4^4$

$=4\cdot4\cdot4\cdot4$

$=16\cdot16$

$=256$

$(t^3)^4$

$=t^{12}$

$(u^2)^4=u^8$

a. $-16t^7u^6p^5$

(b.) $256t^{12}u^8p^4$

c. $-16t^{12}u^6p^4$

d. $256t^7u^8p^5$

---

18. Simplify: $(5h+7)(4h-9)$ $= 20h^2-45h+28h-63$

F O I L

$=20h^2-17h-63$

a. $20h^2-73h-63$

b. $20h^2+18h-62$

c. $20h^2-17h-62$

(d.) $20h^2-17h-63$

---

19. Simplify: $(5x-4y)^2$

a. $25x^2+16y^2$

b. $25x^2-20xy+16y^2$

c. $25x^2+2xy+16y^2$

(d.) $25x^2-40xy+16y^2$

(I) $(a-b)^2$
$=a^2-2ab+b^2$
$(5x-4y)^2$
$=(5x)^2-2(5x)(4y)+(4y)^2$
$=25x^2-40xy+16y^2$

(II) $(5x-4y)^2$
$=(5x-4y)(5x-4y)$
$=25x^2-20xy-20xy+16y^2$
$=25x^2-40xy+16y^2$

---

20. Express the number in scientific notation: 5,400,000

a. $54\times10^5$ (15 .. < 10)

(b.) $5.4\times10^6$

c. $5.4\times10^7$

d. $5.4\times10^8$

$=5.4\times1000000$
$=5.4\times10^6$

---

21. Simplify: $\dfrac{4xy^3+8x^2y+2x^2y^2}{2xy}$

a. $2y^2+8x^2y+1$

b. $2y^2+8x^2y+2xy$

(c.) $2y^2+4x+xy$

d. $2y^2+4x+1$

$=\dfrac{4xy^3}{2xy}+\dfrac{8x^2y}{2xy}+\dfrac{2x^2y^2}{2xy}$
$=2y^2+4x+xy$

---

22. Simplify: $\frac{2a^2-a+3}{a-1}$

(a.) $2a+1, r:4$

b. $3a+1, r:-2$

c. $3a-1, r:-4$

d. $2a-3, r:2$

$$\begin{array}{r|l} 2a+1 & -a-(-2a) \\ a-1\,\overline{)\,2a^2-a+3} & = -a+2a \\ -\,(2a^2-2a) & = a \\ \hline a+3 & \\ -\,(a-1) & 3-(-1) \\ \hline 4 & = 3+1 \\ & = 4 \end{array}$$

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23. Simplify: $\frac{35x^7y^2}{-7x^5y^6}$ $= -\frac{5x^2}{y^4}$

a. $\frac{5x^2}{y^4}$

b. $-\frac{x^2}{5y^4}$

c. $-\frac{5x^{12}}{y^8}$

(d.) $-\frac{5x^2}{y^4}$

$$\frac{y \cdot y}{y \cdot y \cdot y \cdot y \cdot y \cdot y}$$

---

24. Factor: $12x^4y+12x^3y^2-9x^2y^3$ $= 3x^2y(4x^2+4xy-3y^2)$

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

b. $3x^2y(4x^2+4y+3y^2)$

c. $3x^2y(2x+y)(2x-3y)$

d. $3x^2y(4x^2+4y-3y^2)$

$4x^2+4xy-3y^2$

$= (4x+\ \ )(x-\ \ )$ (4 and $3y$; $3y$ and 4)

$= (2x+3y)(2x-y)$ (4 and $3y$; $3y$ and 4)

---

25. Factor: $x^2 - 121$ $= x^2 - 11^2$
$= (x+11)(x-11)$

a. $(x+11)(x+11)$

(b.) $(x+11)(x-11)$

c. $(x-11)(x-11)$

d. $(x+11)(x-9)$

---

26. Solve by factoring: $12x^2 + 25x + 12 = 0$

a. $-\frac{3}{4}, \frac{4}{3}$

b. $\frac{3}{4}, \frac{4}{3}$

c. $\frac{3}{4}, -\frac{4}{3}$

(d.) $-\frac{3}{4}, -\frac{4}{3}$

$(4x+3)(3x+4) = 0$

$4x+3=0$
$4x=-3$
$x=-\frac{3}{4}$

$3x+4=0$
$3x=-4$
$x=-\frac{4}{3}$

$(?x+?)(?x+?) = 0$
$x=\ominus$ $x=\ominus$

$(12x+\ )(x+\ )$

$(6x+\ )(2x+\ )$

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

3 4

---

27. The length of a rectangle is 2 cm less than twice the width. The area of the rectangle is 180 cm$^2$. Find the length of the rectangle.

a. 10 cm $\rightarrow w = 6$

b. 15 cm $\rightarrow w = ?$

(c.) 18 cm $\rightarrow w = 10$

d. 12 cm $\rightarrow w = ?$

$l = 2w - 2$ $\longrightarrow$ $l = 2(10) - 2$
$l = 20 - 2$
$l = 18$

$A = 180 = lw$
$180 = (2w-2)w$
$180 = 2w^2 - 2w$
$0 = 2w^2 - 2w - 180$
$0 = 2(w^2 - w - 90)$
$0 = 2(w+9)(w-10)$

$w+9=0$ | $w-10=0$
$w=-9$ | $w=10$
N/A |

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28. Simplify: $\frac{x^2-6x-16}{x^2-4} = \frac{(x+2)(x-8)}{(x+2)(x-2)} = \frac{x-8}{x-2}$

a. $\frac{x+8}{x-2}$

c. $\frac{x+8}{x+2}$

b. $\frac{x-8}{x+2}$

(d.) $\frac{x-8}{x-2}$

---

29. Simplify: $\frac{x^2}{x-9}\cdot\frac{x^2-7x-18}{x^2+2x} = \frac{x\,x^2}{x-9}\cdot\frac{(x+2)(x-9)}{x(x+2)} = \frac{x}{1} = x$

(a.) $x$

b. $\frac{x^2+2x}{x+2}$

c. $\frac{x^2-2x}{x+2}$

d. $\frac{-7x-18}{-18x}$

---

30. Simplify: $\frac{4}{x+9}+\frac{3}{x-9} = \frac{4(x-9)}{(x+9)(x-9)} + \frac{3(x+9)}{(x+9)(x-9)}$

(a.) $\frac{7x-9}{x^2-81}$

b. $\frac{7}{x^2-81}$

c. $\frac{7}{x+9}$

d. $\frac{7x-9}{7}$

$= \frac{4(x-9)+3(x+9)}{(x+9)(x-9)}$

$= \frac{4x-36+3x+27}{(x+9)(x-9)}$

$= \frac{7x-9}{(x+9)(x-9)}$

$= \frac{7x-9}{x^2-81}$

---

31. Simplify the complex fraction: $\dfrac{\dfrac{x^2-10x+25}{-12x}}{\dfrac{x-5}{-6x}}$

$= \dfrac{\dfrac{(x-5)(x-5)}{-12x}}{\dfrac{x-5}{-6x}} \cdot \dfrac{-12x}{-12x}$

$= \dfrac{(x-5)(x-5)}{2(x-5)}$

a. $\dfrac{x+25}{2x}$

b. $-9x-5$

c. $\dfrac{x+5}{2}$

(d.) $\dfrac{x-5}{2}$

---

32. Solve the equation: $\dfrac{x}{x^2-81}+\dfrac{9}{x-9}=\dfrac{1}{x+9}$

$\dfrac{x}{(x+9)(x-9)}+\dfrac{9}{x-9}=\dfrac{1}{x+9}$ $\times (x+9)(x-9)$

$x+9(x+9)=x-9$

$x+9x+81=x-9$

$10x+81=x-9$

$10x-x=-9-81$

$9x=-90$

$x=\dfrac{-90}{9}$

$x=-10$

a. 10

b. 8

(c.) -10

d. -8

---

33. The ratio of graduate students to undergraduates at a certain university is 2 to 5. If there are 2730 graduate students at the university, how many undergraduates are there?

$\dfrac{\text{grad}}{\text{ug}}=\dfrac{2}{5}$

$\dfrac{2730}{\text{ug}}=\dfrac{2}{5}$

$\xrightarrow{CM} 2730\cdot 5 = 2\cdot \text{ug}$

$13650 = 2\cdot \text{ug}$

$\dfrac{13650}{2} = \text{ug}$

31
2730
$\times$ 5
13650

$2\overline{)13650}$ 6825
$-\ 12$
16
$-\ 16$
5
$-\ 4$
10
$-\ 10$
0

(a.) 6825

b. 19110

c. 9555

d. 13650

---

34. Solve the formula for the given variable:

$y = mx + b$, for $x$.

$y = mx + b$

$y - b = mx$

$\frac{y-b}{m} = x$

a. $x = \frac{y}{m} - b$

c. $x = \frac{y}{m+b}$

b. $x = \frac{y+b}{m}$

(d.) $x = \frac{y-b}{m}$

---

35. Simplify: $\sqrt{8x^{11}y^4}$ $= \sqrt{4 \cdot 2 \cdot x^{10} \cdot x \cdot y^4}$

$= 2x^5y^2\sqrt{2x}$

a. $2xy^2\sqrt{8x}$

c. $4x^{10}y^2\sqrt{2xy}$

b. $x\sqrt{2x}$

(d.) $2x^5y^2\sqrt{2x}$

---

36. Simplify: $x + 5\sqrt{x} - 2\sqrt{x} - 6$

$= x + 3\sqrt{x} - 6$

(a.) $x + 3\sqrt{x} - 6$

c. $x + 7\sqrt{x} - 6$

b. $10x^2 - 6$

d. $-10x^2 - 6$

---

$(x+y)^2 = x^2 + 2xy + y^2$

37. Solve: $\sqrt{x+23} = x + 11$

$\rightarrow (\sqrt{x+23})^2 = (x+11)^2$

$x + 23 = x^2 + 22x + 121$

$0 = x^2 + 22x + 121 - x - 23$

$0 = x^2 + 21x + 98$

$0 = (x+7)(x+14)$

$x + 7 = 0$ or $x + 14 = 0$

$x = -7$ $\quad$ ~~$x = -14$~~ N/A

(a.) -7

b. -14

c. -14, -7

d. No solution

---

$x = -7 \rightarrow \sqrt{-7+23} \stackrel{?}{=} -7 + 11$

$\sqrt{16} \stackrel{?}{=} 4$

$4 = 4$ ✓

$x = -14 \rightarrow \sqrt{-14+23} \stackrel{?}{=} -14 + 11$

$\sqrt{9} \stackrel{?}{=} -3$

$3 = -3$ ✗

38. Solve using quadratic formula: $3x^2 + 6x - 4 = 0$

$a=3 \quad b=6 \quad c=-4$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x_{1,2} = \frac{-6 \pm \sqrt{6^2-4\cdot 3(-4)}}{2\cdot 3}$$

$$x_{1,2} = \frac{-6 \pm \sqrt{36+48}}{6}$$

$$x_{1,2} = \frac{-6 \pm \sqrt{84}}{6} = \frac{-6 \pm \sqrt{4\cdot 21}}{6}$$

$$= \frac{-6 \pm 2\sqrt{21}}{6}$$

$$= \frac{\cancel{2}(-3 \pm \sqrt{21})}{\cancel{6}_3}$$

$$= \frac{-3 \pm \sqrt{21}}{3}$$

a. $\frac{-3+\sqrt{21}}{3}, \frac{-3-\sqrt{21}}{3}$

b. $\frac{3+\sqrt{21}}{3}, \frac{3-\sqrt{21}}{3}$

c. $\frac{-3+2\sqrt{21}}{3}, \frac{-3-2\sqrt{21}}{3}$

d. $\frac{3+2\sqrt{21}}{3}, \frac{3-2\sqrt{21}}{3}$

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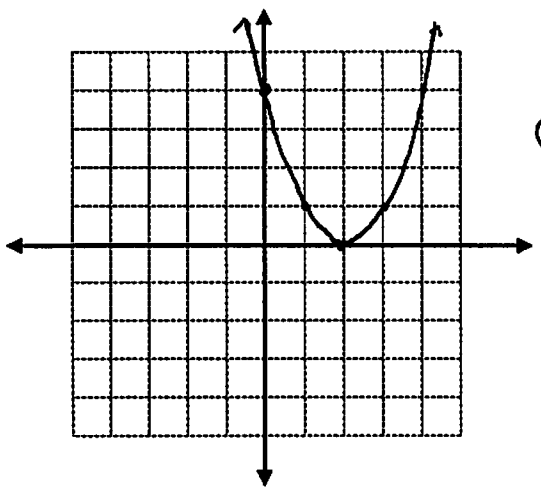
39. Graph: $y = x^2 - 4x + 4$



① y-int

$x=0 \rightarrow y = 0^2 - 4(0) + 4$

$y = 0 - 0 + 4$

$y = 4$

y-int $(0,4)$

② x-int

$y=0 \rightarrow 0 = x^2 - 4x + 4$

$0 = (x-2)(x-2)$

$x-2=0$ or $x-2=0$

$x=2 \qquad x=2$

x-int $(2,0)$

$x=1 \rightarrow y = 1^2 - 4\cdot 1 + 4$

$y = 1 - 4 + 4 = 1$ → $(1,1)$

$x=3 \rightarrow y = 3^2 - 4\cdot 3 + 4$

$= 9 - 12 + 4 = 1$ → $(3,1)$

$x=4 \rightarrow y = 4^2 - 4\cdot 4 + 4$

$y = 16 - 16 + 4 = 4$ → $(4,4)$

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40. One solar heating panel can raise the temperature of water 1 degree in 30 minutes. A second solar heating panel can raise the temperature 1 degree in 45 minutes. How long would it take to raise the temperature of water 1 degree with both solar panels operating?

a. 10 minutes

b. 15 minutes

c. 18 minutes

d. 12 minutes

① Let $t$ be the time it take both solar panel operating to raise the temperature of water 1°.

② $\frac{t}{30} + \frac{t}{45} = 1$

③ $\times 90$

$3t + 2t = 90$

$5t = 90$

$t = 18$

④ They need 18 min to raise 1°.