Pre-Calculus Math 11

Practice Final Exam

Part A: Non-Calculator Section

1. Evaluate $|-4-7|-4|7| = |-11| - 28 = 11-28 = -17$

   A. 57 (B) −17 C. 17 D. −105

2. Evaluate $|-2x^2+3x-1|$ for when $x=2$

   (A) 3 B. −3 C. 12 D. −12

   $|-2(2)^2+3(2)-1| = |-2(4)+6-1| = |-8+5| = |-3| = 3$

3. Write the following as an entire radical: $4\sqrt[3]{3}$

   A. $\sqrt[3]{12}$ B. $\sqrt[3]{7}$ (C) $\sqrt[3]{192}$ D. $\sqrt[3]{36}$

   $\sqrt[3]{4^3 \cdot 3} = \sqrt[3]{64 \cdot 3} = \sqrt[3]{192}$

4. Write the mixed radical $-4\sqrt{\frac{1}{2}}$ as an entire radical.

   (A) $-\sqrt{8}$ B. $\sqrt{8}$ C. $-\sqrt{\frac{1}{8}}$ D. $\sqrt{\frac{1}{16}}$

   $-\sqrt{4^2 \cdot \frac{1}{2}} = -\sqrt{16 \cdot \frac{1}{2}} = -\sqrt{8}$

5. Simplify the expression and rationalize the denominator: $\frac{\sqrt{3}}{\sqrt{2}} - \frac{2}{\sqrt{6}}$ LCD: $\sqrt{6}$ $= \frac{(3-2)}{\sqrt{6}} = \frac{1}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{6}}{6}$

   A. $\frac{\sqrt{2}}{-2\sqrt{3}}$ (B) $\frac{\sqrt{6}}{6}$ C. $\sqrt{6}$ D. $\frac{\sqrt{2}}{2\sqrt{3}}$

6. Solve: $\frac{2\sqrt{-x}}{2} = \frac{4}{2} \rightarrow (\sqrt{-x})^2 = (2)^2 \rightarrow \frac{-x}{-1} = \frac{4}{-1} \rightarrow x = -4$

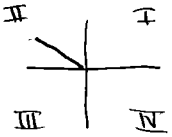
   (A) −4 B. −16 C. −2 D. *no solution*

7. Solve: $\sqrt{3x+2}+1=3 \rightarrow (\sqrt{3x+2})^2 = (2)^2 \rightarrow 3x+2=4 \rightarrow 3x=2 \rightarrow x=\frac{2}{3}$

   A. 2 B. 3 (C) $\frac{2}{3}$ D. −3

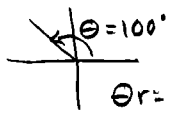
8. In what quadrant does the terminal arm of a standard position angle of 170° lie?

   A. I (B) II C. III D. IV

9. Determine the reference angle for a standard position angle of 100°.

   A. 10° (B) 80° C. 100° D. −80°

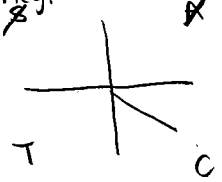
   

   $\theta_r = 180° - 100° = 80°$

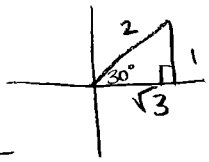
10. In which quadrant does a standard position angle fall if $\cos x > 0$, and $\sin x < 0$?

    A. I B. II C. III (D) IV

    ↳cos is pos. ↳sin is neg.

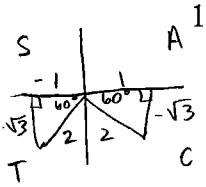
11. Determine the exact value of $\cos(30°)$



↳ adj / hyp

A. $\sqrt{3}$ B. 1 C. $\frac{\sqrt{3}}{2}$ D. $\frac{1}{\sqrt{3}}$

12. Given that $\sin x = -\frac{\sqrt{3}}{2}$, determine the exact value of x, if $0 \le x < 360°$.



negative

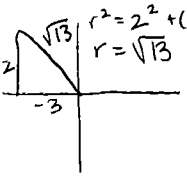
$\theta_r = 60°$

$\theta_1 = 180° + 60° = 240°$

$\theta_2 = 360° - 60° = 300°$

A. 150°, 330° B. 210°, 330° C. 240°, 300° D. 210°, 300°

13. If the point $(-3,2)$ is on the terminal arm of a standard position angle θ, then determine the exact value of $\sin\theta$.

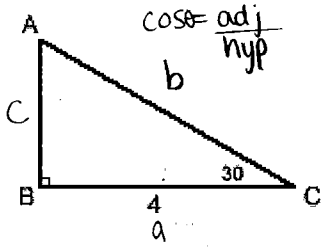


$r^2 = 2^2 + (-3)^2$

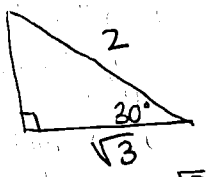
$r = \sqrt{13}$

A. $\frac{2}{\sqrt{13}}$ B. $\frac{-3}{\sqrt{13}}$ C. $\frac{2}{\sqrt{5}}$ D. $\frac{-3}{\sqrt{5}}$

14. Determine the exact value of the side AC in the given triangle.



$\cos\theta = \frac{adj}{hyp}$



$\cos 30° = \frac{\sqrt{3}}{2}$

$\frac{\sqrt{3}}{2} = \frac{4}{b}$

$b\sqrt{3} = 8$

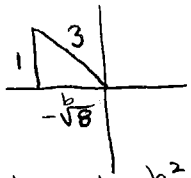
$b = \frac{8}{\sqrt{3}}$

A. 8 B. $\frac{8}{\sqrt{3}}$ C. $\frac{4}{\sqrt{3}}$ D. $\frac{\sqrt{3}}{2}$

15. If $\sin x = \frac{1}{3}$ and $\tan x < 0$, then determine the exact value of $\tan x$.

↳ pos

neg



$\tan x = \frac{1}{-\sqrt{8}}$

$b^2 = 3^2 - 1^2 \rightarrow b^2 = 8 \rightarrow b = \sqrt{8}$

A. $-\frac{1}{\sqrt{8}}$ B. $-\sqrt{8}$ C. $-\frac{\sqrt{8}}{3}$ D. $-\frac{3}{\sqrt{8}}$

16. Solve $2x^2 - x = 6$

$-6 \quad -6$

$2(-6) = -12$

$-4 \quad +3$

$2x^2 - x - 6 = 0 \rightarrow 2x^2 - 4x + 3x - 6 = 0$

$2x(x-2) + 3(x-2) = 0$

$(2x+3)(x-2) = 0$

A. $x = -\frac{3}{2}, 2$ B. $x = -2, \frac{3}{2}$ C. $x = \frac{3}{2}, 2$ D. $x = -2, -\frac{3}{2}$

17. Solve $|x-2| = 5$

$x - 2 = 5$

$x = 7$

$-(x-2) = 5$

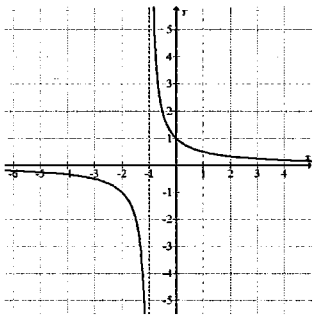
$-x + 2 = 5$

$-x = 3$

$x = -3$

A. $x = 7$ B. $x = -3, 7$ C. $x = -7, 3$ D. $x = 3, 7$

18. Determine the equation of the function graphed on the right.



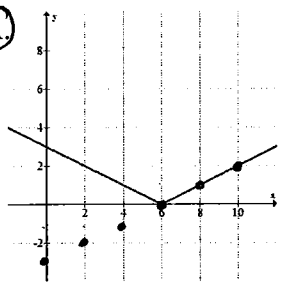
A. $y = \frac{1}{x}$ B. $y = \frac{1}{x-1}$ C. $y = \frac{1}{x+1}$ D. $y = \frac{1}{\frac{1}{2}x+1}$

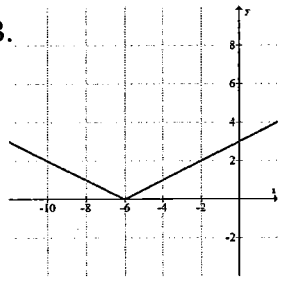
$x \neq -1$

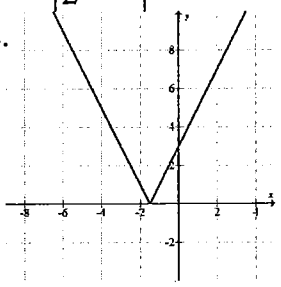
$(x+1) \neq 0$

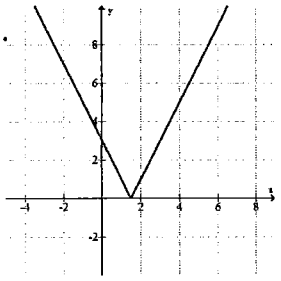
$\frac{1}{x+1}$

19. Which of the following best represents the graph of $y = \left|\frac{1}{2}x - 3\right|$

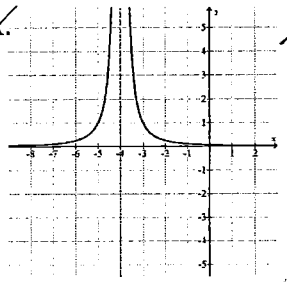
(A) 

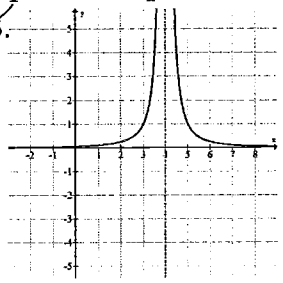
B. 

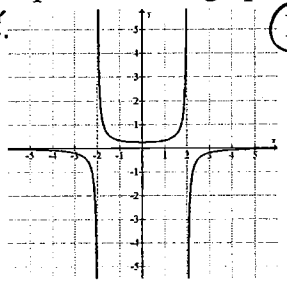
C. 

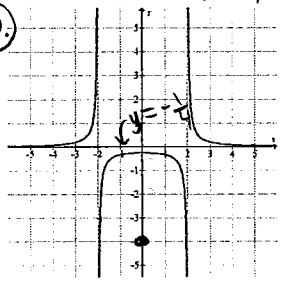
D. 

20. Which of the following graphs best represents the reciprocal of the graph $y = x^2 - 4$ → $(x+2)(x-2)$ $x = 2, x = -2$

~~A.~~ 

~~B.~~ 

~~C.~~ 

(D) 

Part B: Calculator Section

$-20 \div -4 = 5$

1. Determine the first term in the geometric sequence: ___, –20, 80 (×−4)

(A) 5 B. –4 C. –120 D. 4

2. Determine the common difference of the arithmetic sequence –2.4, –0.3, 1.8, …

A. –2.7 B. –2.1 (C) 2.1 (+2.1) D. 2.7

3. Determine the 10th term of the arithmetic series $6 + 7.2 + 8.4 + \ldots$ $n=10, t_1=6, d=1.2$

(A) 16.8 B. 18 C. 30.96 D. 114 $t_{10} = 6 + (10-1)(1.2)$

4. Determine the partial sum S_{12} for the arithmetic series $-12 - 9 - 6 - \ldots$ *don't know last term

A. 21 B. –342 C. 72 $t_1 = -12$, $n = 12$, $d = +3$ (D) 54 $S_{12} = 12\left[\frac{2(-12) + 3(12-1)}{2}\right]$

5. If three consecutive terms in an arithmetic sequence are given by 4, *k*, 10, then determine *k*.

A. 1.25 B. 3 (C) 7 (+d +d) D. 6 $4 + 2d = 10$, $d = 3$, $\therefore k = 7$

$r = \frac{30}{-45} = -\frac{2}{3}$

6. Find the sum of the infinite geometric series $-45 + 30 - 20 \ldots$

$S = \frac{t_1}{1-r} = \frac{-45}{1+\frac{2}{3}}$

A. –135 B. –35 (C) –27 D. *no finite sum*

7. In a geometric sequence $t_2 = 10$ and $t_3 = 4$, determine t_4. $\frac{25}{\div r}$ $\frac{10}{\div r}$ $\frac{4}{}$ ___ $r = \frac{4}{10} = \frac{2}{5}$

A. 0.4 (B) 1.6 C. 0.64 D. 25 $t_4 = 25 \cdot \left(\frac{2}{5}\right)^{4-1}$

8. Determine the 9th term in the geometric sequence –16, –24, –36…

A. –615.09 (B) –410.06 C. –922.64 D. –0.62

$r = \frac{-24}{-16} = \frac{3}{2}$ $t_9 = -16 \cdot \left(\frac{3}{2}\right)^{9-1}$

$t_1 = -16$

$n = 9$

9. The series $3+9+27+\ldots$ could be classified as

A. Geometric (convergent) (B.) Geometric (divergent)
C. Arithmetic D. None of these

10. Determine the sum of the first 14 terms of the geometric series $-1+2-4+\ldots$.

A. 8192 B. –2731 C. 8191 (D.) 5461

11. If the sum of an infinite geometric series is 27, and the common ratio is $\frac{1}{3}$, determine the first term.

(A.) 18 B. 40.5 C. 81 D. 9

12. Determine the number of terms in the series $\sum_{j=3}^{12} j^2$

(A.) 10 B. 11 C. 12 D. 13

13. How many terms are in the geometric sequence 2, 6, 18, …, 13122?

A. 7 B. 8 (C.) 9 D. 10

14. What is the partial sum S_{11} of this geometric series $3+6+12\ldots$ if $t_{11}=3072$?

(A.) 6141 B. 3069 C. no finite sum D. 1533

15. Evaluate $\sum_{k=1}^{8} 3k-7$

(A.) 52 B. 35 C. –229 D. 72

Use the quadratic function $y=-3(x+4)^2+5$ for the following **4** questions.

16. Determine the equation of the axis of symmetry of the parabola.

A. $x=4$ (B.) $x=-4$ C. $y=5$ D. $y=-5$

17. Determine the coordinates of the vertex of the parabola.

(A.) $(-4,5)$ B. $(4,5)$ C. $(-4,-5)$ D. $(4,-5)$

18. Determine the range of the graph.

A. $-5\le y$ B. $y\le -5$ C. $5\le y$ (D.) $y\le 5$

19. Determine the domain of the above function.

A. $4\le x$ B. $x\le 4$ C. $x\le -4$ (D.) $x\in\Re$

20. Determine the coordinates of the vertex of the parabola $y=x^2+6x+2$

(A) $(-3,-7)$ B. $(-3,7)$ C. $(3,-7)$ D. $(3,7)$

$\frac{1}{2}(6)=3 \rightarrow 3^2=9$

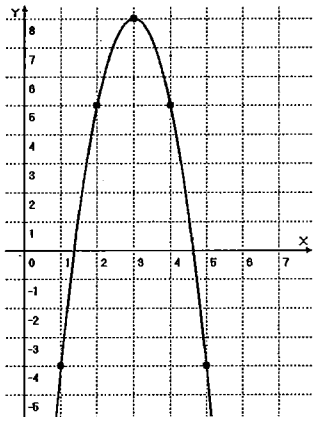
$y=(x^2+6x+9)-9+2$

$y=(x+3)^2-7$

$\leftarrow 3 \downarrow 7$

Use the graph of the parabola on the right to answer the following **3** questions, given the equation $y=a(x-p)^2+q$

$y=-3(x-3)^2+8$



21. Determine the value of q.

A. 4 B. –4 (C) 8 D. –8

22. Determine the value of a.

A. –5 B. 5 (C) –3 D. 3

23. Determine the y-intercept of the graph. - Set $x=0$

A. $y=-9$ (B) $y=-19$ C. $y=-27$ D. $y=-35$

$y=-3(-3)^2+8 \rightarrow y=-27+8$

24. Convert the general form equation $y=x^2+6x+4$ to standard form. $\frac{1}{2}(6)=3 \rightarrow 3^2=9$

$y=(x+3)^2-9+4$

A. $y=(x+3)^2+4$ B. $y=(x-3)^2+4$ C. $y=(x-3)^2-5$ (D) $y=(x+3)^2-5$

25. Convert the general form equation $y=(-2x^2+8x)-7$ to standard form. $y=-2(x^2-4x)-7$

(A) $y=-2(x-2)^2+1$ B. $y=-2(x-2)^2-11$ C. $y=-2(x+4)^2-23$ D. $y=-2(x+4)^2+39$

$\frac{1}{2}(-4)=-2 \rightarrow (-2)^2=4$

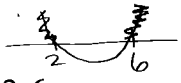
26. Solve $x^2+x-3=0$ $x=\frac{-1\pm\sqrt{1^2-4(1)(-3)}}{2(1)}=\frac{-1\pm\sqrt{13}}{2}$

$y=-2(x^2-4x+4-4)-7$

(A) $x=\frac{-1\pm\sqrt{13}}{2}$ B. $x=\frac{-1\pm\sqrt{11}}{2}$ C. $x=\frac{-1\pm2\sqrt{2}}{2}$ D. *no solution*

$y=-2(x-2)^2+8-7$

27. Solve the quadratic inequality $0<x^2-8x+12$ $0<(x-6)(x-2)$ →



A. $-6<x<-2$ B. $x<-6,-2<x$ C. $2<x<6$ (D) $x<2,6<x$

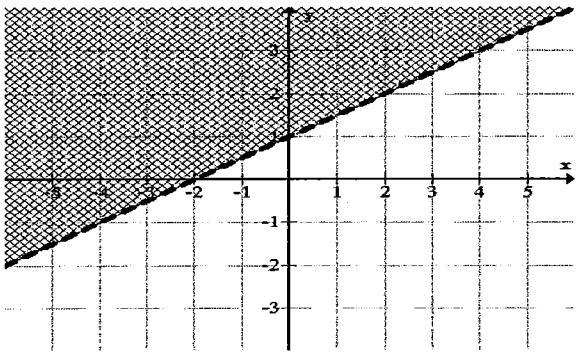
28. Determine the equation of the inequality.

(A) $y>\frac{1}{2}x+1$ Test (0,0): $0>0+1$ false

B. $y\geq\frac{1}{2}x+1$

C. $y<\frac{1}{2}x+1$

D. $y\leq\frac{1}{2}x+1$



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29. Two numbers are related in this way: 3 subtracted from the first number then squared is less than or equal to the other number plus 7. Which equation represents this situation?

A. $x^2-3\geq y+7$ B. $x^2-3\leq y+7$ C. $(x-3)^2\geq y+7$ (D) $(x-3)^2\leq y+7$

Vertex $(-3,3)$

$\leftarrow 3 \downarrow 3$

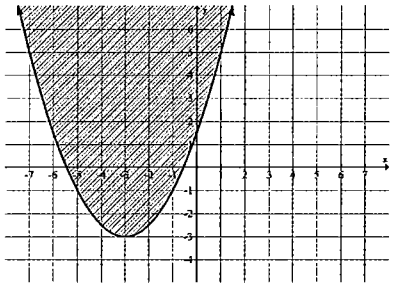
Test $(0,0)$:

$0 \geq \frac{1}{2}(3)^2 - 3$

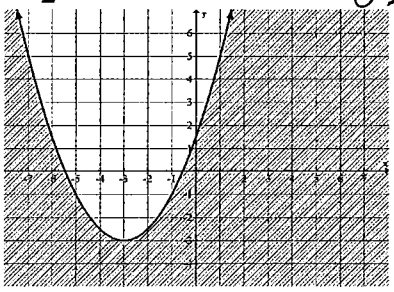
$0 \geq 1.5$ ×

30. Which graph below best represents the inequality $y \geq \frac{1}{2}(x+3)^2 - 3$

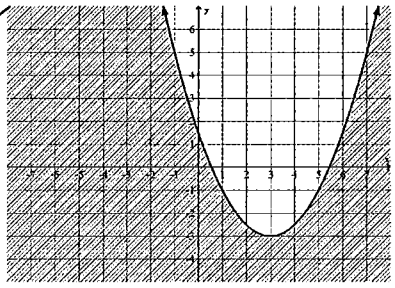
A.



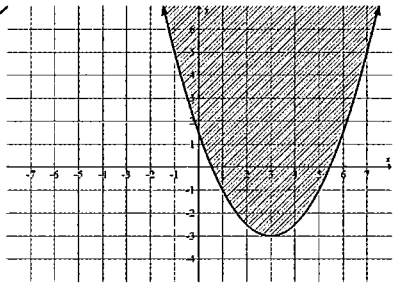
B.



C.



D.

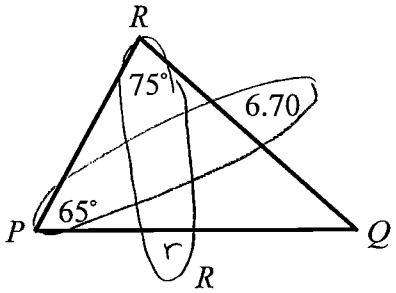


31. Determine the length of the side PQ

A. 6.07
B. 6.29
C. 6.47
D. 7.14

$\frac{r}{\sin 75^\circ} = \frac{6.70}{\sin 65^\circ}$

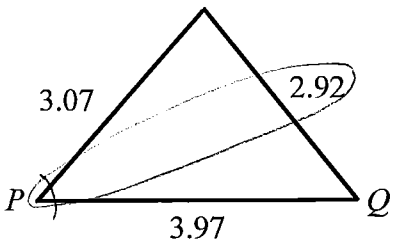
$r = \frac{\sin 75^\circ \times 6.70}{\sin 65^\circ}$



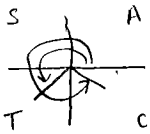
32. Determine the measure of $\angle P$

A. 36°
B. 43°
C. 47°
D. 68°

$\cos P = \frac{2.92^2 - 3.07^2 - 3.97^2}{-2(3.07)(3.97)}$



$x = -12$



33. Solve: $\sin x = -0.208$ on the interval $0 \leq x < 360^\circ$

A. $x = -12^\circ$ B. $x = 192^\circ, 348^\circ$ C. $x = 12^\circ, 168^\circ$ D. $x = -12^\circ, 192^\circ$

$(x+4)(x-4)$

$(x+4)(x-2)$

$x \neq -4, 2$

34. Simplify the rational expression $\frac{x^2-16}{x^2+2x-8}$ and state non-permissible values.

A. $\frac{x-4}{x-2}$, $x \neq -4, 2$ B. $\frac{x+4}{x-2}$, $x \neq -4, 2$ C. $\frac{x+4}{x-2}$, $x \neq -4, -2$ D. $\frac{x-4}{x-2}$, $x \neq -2, 4$

35. Simplify $\frac{10a^5b^2}{a} \div \frac{ab}{2} = \frac{10a^5b^2}{a} \times \frac{2}{ab} = 20a^3b$

A. $20a^3b$ B. $5a^5b^3$ C. $\frac{20}{a^3b}$ D. $\frac{5}{a^5b^3}$

$\frac{(x-3)(x+2)}{(x+5)(x+2)} \times \frac{(x+5)(x+1)}{(2x-1)(x+1)}$

36. Express the quotient $\frac{x^2-x-6}{x^2+7x+10} \div \frac{2x^2+x-1}{x^2+6x+5}$ in simplest form.

$2(-1) = -2$, $2 \quad -1$, $2x^2+2x-x-1$, $2x(x+1)-(x+1)$

A. $\frac{2x-1}{x-3}$ (B.) $\frac{x-3}{2x-1}$ C. $\frac{(x-3)(2x-1)}{(x+5)^2}$ D. $\frac{(x+5)^2}{(x-3)(2x-1)}$

37. Simplify $\frac{5}{x+3}-\frac{2}{x-3} = \frac{5(x-3)-2(x+3)}{x^2-3x+3x-9} = \frac{5x-15-2x-6}{x^2-9} = \frac{3x-21}{x^2-9}$

(A.) $\frac{3x-21}{x^2-9}$ B. $\frac{3}{x+3}$ C. $\frac{7}{x+3}$ D. $\frac{7x-9}{x^2-9}$

38. Solve for x exactly: $\frac{1}{x}-\frac{1}{x+2}=3 \rightarrow \frac{x+2-x}{x(x+2)} = \frac{3x(x+2)}{x(x+2)} \rightarrow 2 = 3x^2+6x$

$0 = 3x^2+6x-2$

A. $x=\frac{-3\pm\sqrt{21}}{3}$ (B.) $x=\frac{-3\pm\sqrt{15}}{3}$ C. $x=\frac{-3\pm\sqrt{3}}{3}$ D. *no solution*

$x = \frac{-6\pm\sqrt{6^2-4(3)(-2)}}{2(3)}$, $x = \frac{-6\pm\sqrt{60}}{6}$, $x = \frac{-6\pm 2\sqrt{15}}{6}$

39. Elli and Helmut are meeting at the Big Bird Auction and Ice Cream Emporium in Vancouver this weekend. Elli has to travel 480*km* while Helmut only has to travel 387*km*. On average, Elli travels 10*km/h* faster than Helmut. If Elli's trip takes a half-hour longer than Helmut's, which of the following equations could be used to determine Helmut's average speed?

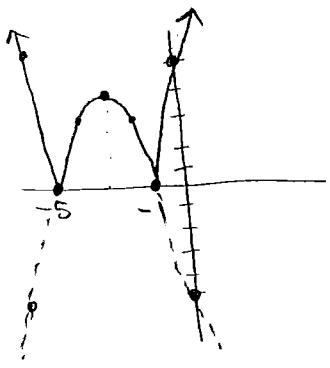
A. $\frac{480}{x+10}-30=\frac{387}{x}$ B. $\frac{480}{x+10}+30=\frac{387}{x}$ C. $\frac{480}{x+10}+\frac{1}{2}=\frac{387}{x}$ (D.) $\frac{480}{x+10}-\frac{1}{2}=\frac{387}{x}$

$\frac{1}{2}$ of an hour, units are in hrs

40. Determine the piece-wise equation that best represents the function $y=\left|-(x+3)^2+4\right|$

(A.) $y=\begin{cases}(x+3)^2-4 & x<-5\\ -(x+3)^2+4 & if \quad -5\le x\le -1\\ (x+3)^2-4 & -1<x\end{cases}$ B. $y=\begin{cases}(x+3)^2+4 & x<-5\\ -(x+3)^2+4 & if \quad -5\le x\le -1\\ (x+3)^2+4 & -1<x\end{cases}$

C. $y=\begin{cases}-(x+3)^2+4 & x<-5\\ (x+3)^2-4 & if \quad -5\le x\le -1\\ -(x+3)^2+4 & -1<x\end{cases}$ D. $y=\begin{cases}-(x+3)^2+4 & x<-5\\ (x+3)^2+4 & if \quad -5\le x\le -1\\ -(x+3)^2+4 & -1<x\end{cases}$



Part C: Open-Ended Section

1. Solve the following system of equations algebraically.

$$y = -3x + 5$$
$$y = 3(x-4)^2 - 7$$

$-3x+5 = 3(x-4)^2 - 7$

$+7 \qquad +7$

$-3x+12 = 3(x^2-4x-4x+16)$

$-3x+12 = 3x^2-24x+48$

$+3x \quad -12 \qquad +3x \quad -12$

$0 = 3x^2-21x+36$

$0 = 3(x^2-7x+12)$

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

$\downarrow \qquad \downarrow$

$x=4 \qquad x=3$

$y = -3(4)+5 = -7$

$y = -3(3)+5 = -4$

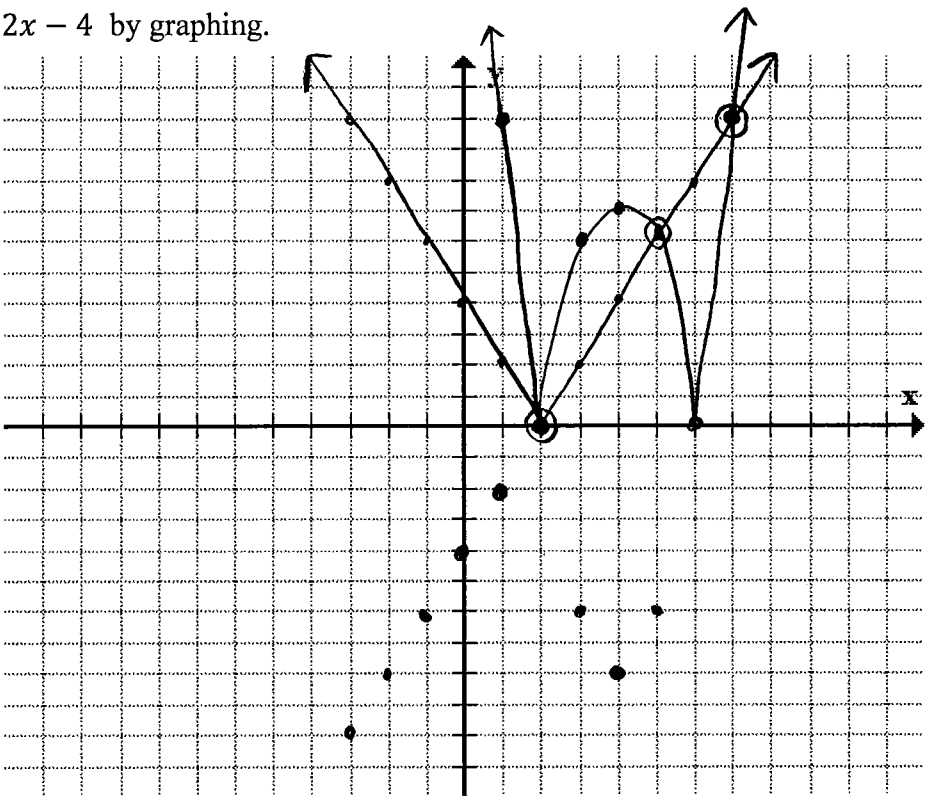
∴ Solutions are: (4, -7) and (3, -4)

2. Solve $|2(x-4)^2 - 8| = 2x - 4$ by graphing.

$\rightarrow 4 \downarrow 8$

Steps: 1, 3, 5

x2 : 2, 6, 10



Solutions: x=2, x=5, x=7

3. Solve algebraically: $|-3x^2 - 18x - 23| = 8$

case ①

$-3x^2 - 18x - 23 = 8$

$-8 \quad -8$

$-3x^2 - 18x - 31 = 0$

↳ doesn't factor ∴

$a = -3 \quad b = -18 \quad c = -31$

$$x = \frac{-(-18) \pm \sqrt{(-18)^2 - 4(-3)(-31)}}{2(-3)}$$

$$x = \frac{18 \pm \sqrt{-48}}{-6}$$

can't $\sqrt{\ }$ a negative

∴ no solution!

case ②

$-(-3x^2 - 18x - 23) = 8$

$3x^2 + 18x + 23 = 8$

$-8 \quad -8$

$3x^2 + 18x + 15 = 0$

$3(x^2 + 6x + 5) = 0$

$3(x + 5)(x + 1) = 0$

$\downarrow \qquad \downarrow$

$x = -5 \qquad x = -1$