Math 20-1

Key

L44 – Worksheet – Review of Absolute Values

Part 1 – 7.1 Absolute Value

Q1: Evaluate the following expressions:

$|-3+2|$

$|-1|$

1

$|5-9|+2$

$|-4|+2$

$4+2$

6

$6-2|4-3^2|$

$6-2|4-9|$

$6-2(|-5|)$

$6-2(5)$

$6-10$

-4

$9+|2^3-5|+1$

$9+|8-5|+1$

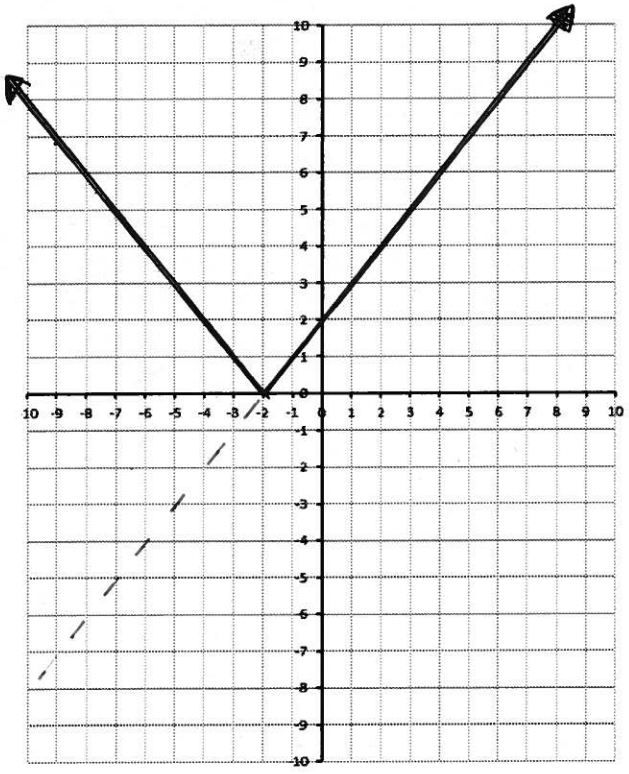
$9+|3|+1$

$9+3+1$

13

Part 2 – 7.2 Absolute Value Functions

Q2: Graph $y = |x+2|$



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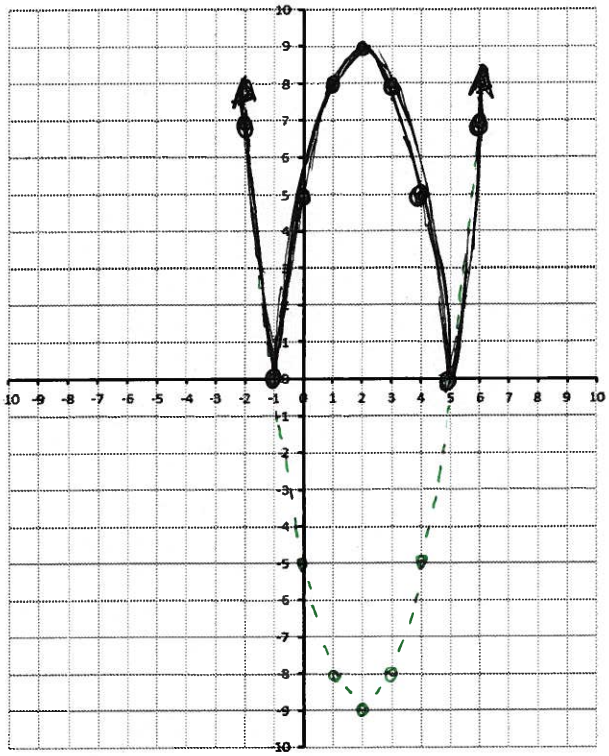
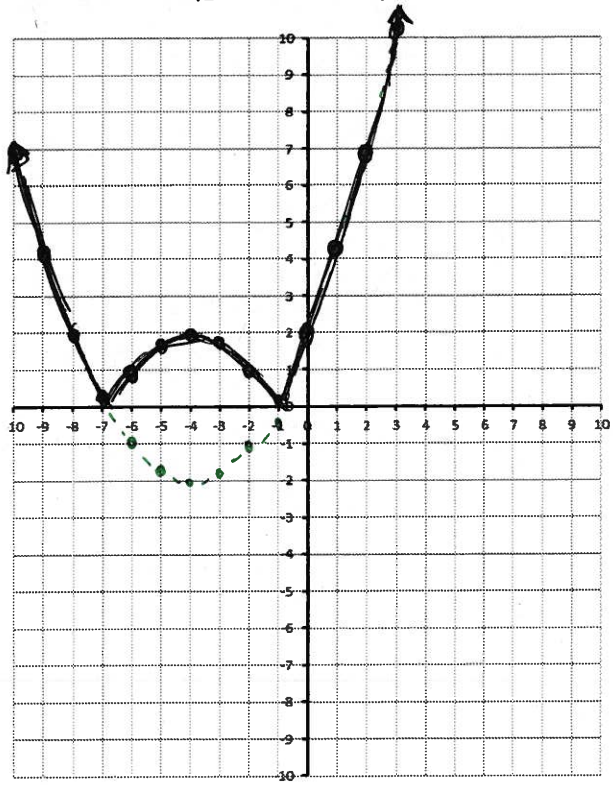
Q3: Graph $y = |x^2 - 4x - 5|$



Q4: Graph $y = \left|\frac{1}{2}(x+4)^2 - 2\right|$ or $y = |0.25x^2 + 2x + 2|$



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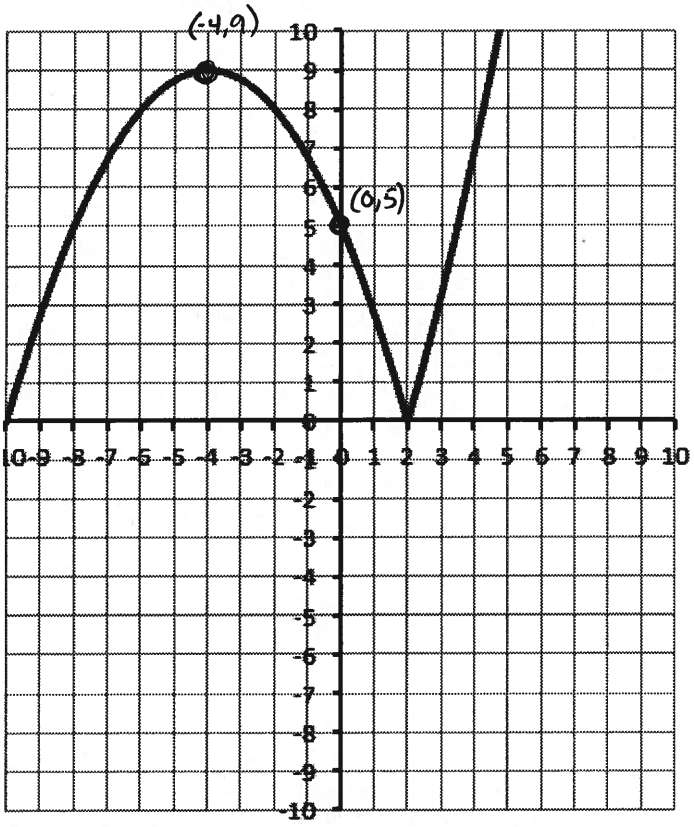
Q5: Write the piecewise function to describe the graph below.



$y = a(x-h)^2+k$

$y = a(x+4)^2+9$ Use (0,5)

$5 = a(0+4)^2+9$

$-9 \quad -9$

$-4 = a(4)^2$

$\div 16 \quad \div 16$

$-\frac{1}{4} = a$

$y = -\frac{1}{4}(x+4)^2+9$

So for second parabola

$y = -\left[-\frac{1}{4}(x+4)^2+9\right]$

$y = \frac{1}{4}(x+4)^2-9$

So $y = \frac{1}{4}(x+4)^2-9$ for $x \leq -10$

$y = -\frac{1}{4}(x+4)^2+9$ for $-10 < x < 2$

$y = \frac{1}{4}(x+4)^2-9$ for $x \geq 2$

Not necessary, but interesting alternative to building this eqn

Zeroes at -10 and 2

Opens downward with $a = -\frac{1}{4}$

$y = a(x-r_1)(x-r_2)$

$y = -\frac{1}{4}(x-(-10))(x-2)$ ← You can see that when $y=0$, $x=-10$ or $+2$

$y = -\frac{1}{4}(x+10)(x-2)$

$= -\frac{1}{4}(x^2+8x-20)$

$= -\frac{1}{4}x^2-2x+5$

So $y = -\frac{1}{4}x^2-2x+5$ for $-10 < x < 2$

$y = -\left[-\frac{1}{4}x^2-2x+5\right]$ or $y = \frac{1}{4}x^2+2x-5$ for $x \leq -10$, $x \geq 2$.

Key

Part 3 – 7.3 Absolute Value Equations

Q6: Solve $|x^2 + 2x - 3| = 5$ algebraically. Verify your answers. Confirm by graphing.

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

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

$-5 \quad -5$

$x^2+2x-8 = 0$

$(x+4)(x-2) = 0$

$x = -4 \qquad x = +2$

Verify

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

$|16-8-3| = 5$

$|5| = 5$

Yes!

Verify

$|(2)^2+2(2)-3| = 5$

$|4+4-3| = 5$

$|5| = 5$

Yes!

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

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

$-5 \quad -5$

$-x^2 - 2x - 2 = 0$

$\div(-1) \quad \div(-1) \quad \div(-1) \quad \div(-1)$

$x^2 + 2x + 2 = 0$

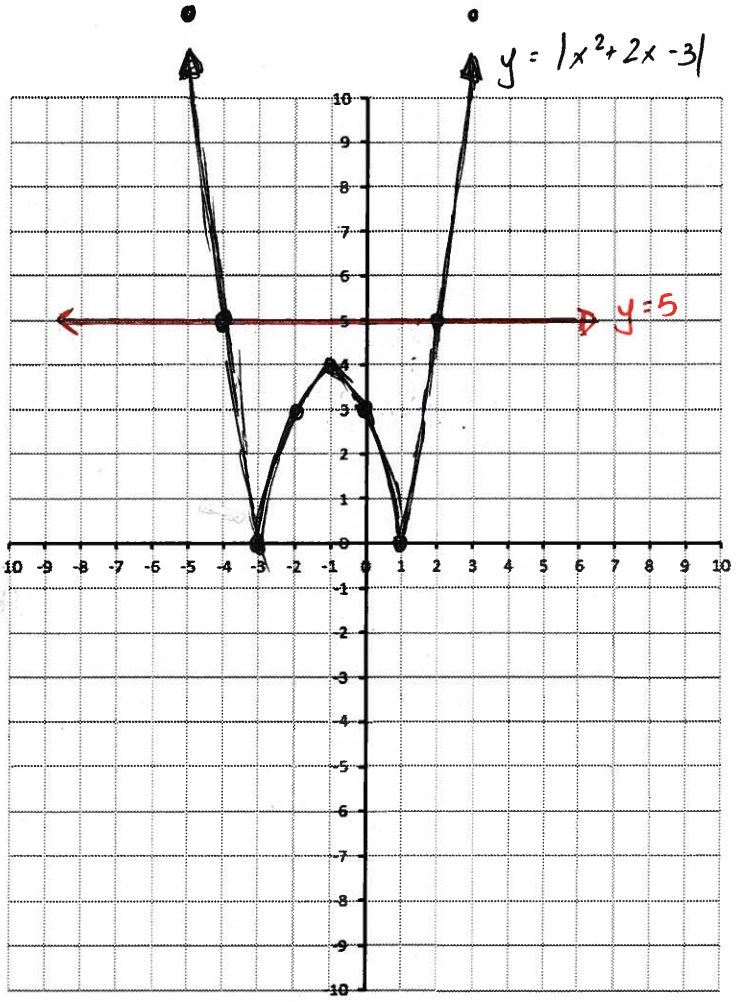
$x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$x = \dfrac{-2 \pm \sqrt{(-2)^2-4(1)(2)}}{2(1)}$

$x = \dfrac{-2 \pm \sqrt{4-8}}{2}$

$x = \dfrac{-2 \pm \sqrt{-4}}{2}$ ← Can't root a negative.

Solns are $x = -4, +2$



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24 → 2, 12 → 2, 6

Q7: Solve $|2x - 8| = -2x^2 + 6x + 2$ algebraically. Verify your answers. Confirm by graphing.

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

$2x-8 = -2x^2+6x+2$

$+2x^2-6x-2 \quad +2x^2-6x-2$

$2x^2-4x-10 = 0$

$\div 2 \quad \div 2 \quad \div 2 \quad \div 2$

$x^2-2x-5 = 0$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{2 \pm \sqrt{(-2)^2-4(1)(-5)}}{2(1)}$

$= \frac{2 \pm \sqrt{4+20}}{2} = \frac{2 \pm \sqrt{24}}{2}$

$= \frac{2 \pm 2\sqrt{6}}{2} = 1 \pm \sqrt{6}$

$x_1 = 1+\sqrt{6} \quad x_2 = 1-\sqrt{6}$

Neither decimal approximation verifies.

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

$-2x+8 = -2x^2+6x+2$

$+2x^2-6x-2 \quad +2x^2-6x-2$

$2x^2-8x+6 = 0$

$\div 2 \quad \div 2 \quad \div 2 \quad \div 2$

$x^2-4x+3 = 0$

$(x-1)(x-3) = 0$

$x = 1 \quad x = 3$

Verify ↓

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

$|-6| = 6$

Yes!

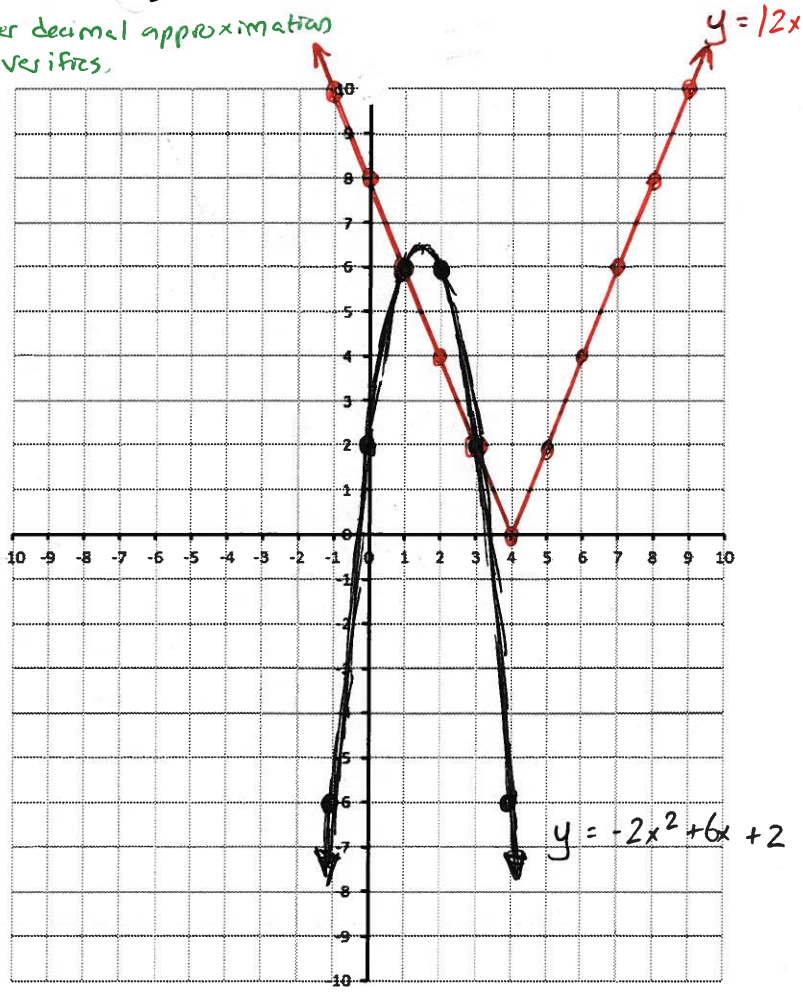
Verify ↓

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

$|6-8| = -18+18+2$

$|-2| = 2$

Yes!



Soln is $x = 1, 3$

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Q8: Solve $|x^2 - 8| = x^2 + x + 2$ algebraically. Verify your answers. Confirm by graphing.

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

$x^2-8 = x^2+x+2$

$-x^2+8 \quad -x^2 \quad +8$

$0 = x+10$

$-10 \quad -10$

$x = -10$

Verify

$|(-10)^2-8| = (-10)^2+(-10)+2$

$|100-8| = 100-10+2$

$|92| = 92$

Yes!

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

$-x^2+8 = x^2+x+2$

$+x^2 \; -8 \quad +x^2 \quad -8$

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

$-3 \; +4$

$\square+\square = 1$

$\square\times\square = -12$

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

$0 = (2x^2-3x)+(4x-6)$

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

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

$2x-3=0$

$x = 3/2$ or 1.5

Verify

$|(3/2)^2-8| = (3/2)^2+(3/2)+2$

$|\frac{9}{4}-\frac{32}{4}| = \frac{9}{4}+\frac{3}{2}+2$

$|-\frac{23}{4}| = \frac{23}{4}$

Yes!

$x+2=0$

$x=-2$

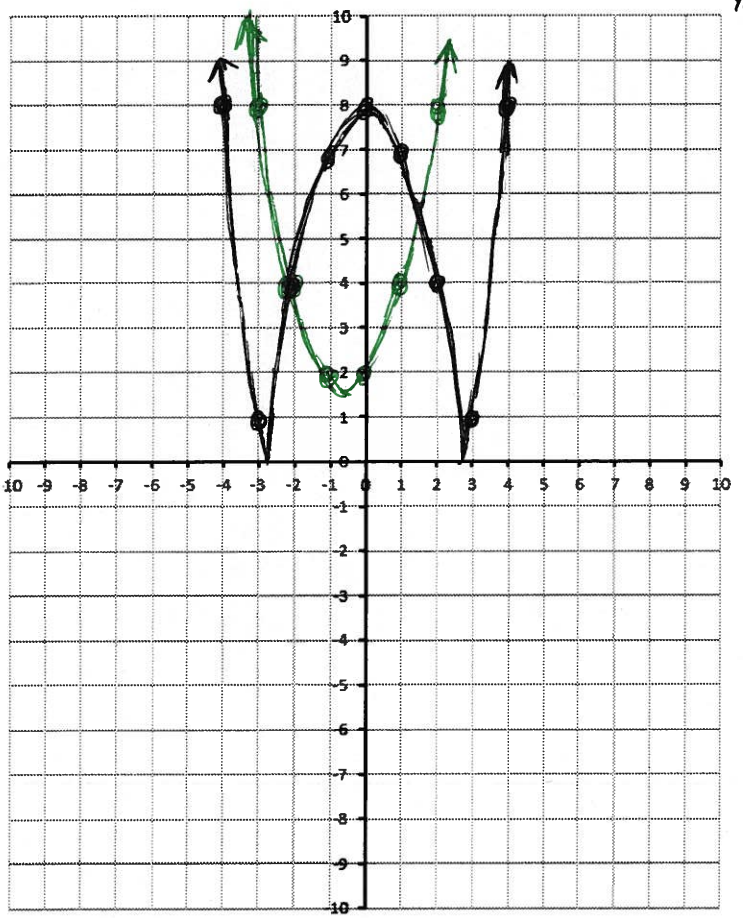
Verify

$|(-2)^2-8| = (-2)^2+(-2)+2$

$|4-8| = 4-2+2$

$|-4| = 4$

Yes!



Solns are $x = -10, -2, 3/2$