2. Evaluate

$$\sqrt{2001^2 - 1999^2}$$

$$= \sqrt{(2001+1999)(2001-1999)}$$

$$= \sqrt{(4000)(2)}$$

4 1000

100 10

$\sqrt{5}$

2

$$= 2 \cdot 10 \cdot 2\sqrt{5}$$

$$= 40\sqrt{5}$$

3. Factor completely, using only positive integer exponents and radicals if necessary.

$3(2x+1)^2(2)(x+1)^{1/2} + (2x+1)^3\left(\frac{1}{2}\right)(x+1)^{-1/2}$

$$(2x+1)^2(x+1)^{-\frac{1}{2}}\left(3\cdot 2\cdot(x+1)+(2x+1)\left(\frac{1}{2}\right)\right)$$

$$=\frac{(2x+1)^2}{\sqrt{x+1}}\left(6x+6+x+\frac{1}{2}\right)$$

$$=\frac{(2x+1)^2}{\sqrt{x+1}}(7x+6.5)$$

2. For every real number x, $[x]$ denotes the greatest integer less than or equal to x. Find all values of x in the interval $2 \le x < 5$ that satisfy $[x]^2 = [x^2]$.

$[x] = 2, 3, 4$

$[x]^2 = 4 = [x^2] \rightarrow 4 \le x^2 < 5$

$2 \le x < \sqrt{5}$

$9 = [x^2] \rightarrow 9 \le x^2 < 10$

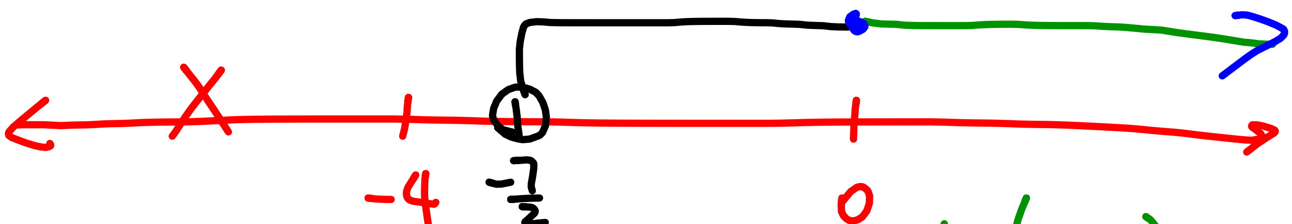
16

$3 \le x < \sqrt{10}$

$4 \le x < \sqrt{17}$

$2 \le x < \sqrt{5}$ or $3 \le x < \sqrt{10}$ or $4 \le x < \sqrt{17}$

5. Solve for x.
$|x| - |x+4| < 3$



$-x - (-(x+4)) < 3$

$\cancel{-x + x} + 4 < 3$

$4 < 3$

$-x - (x+4) < 3$

$-2x - 4 < 3$

$-2x < 7$

$x > \frac{-7}{2}$

$x - (x+4) < 3$

$-4 < 3$

$x = 0$

$0 - |0+4| < 3$ ✓

8. Let $\left(x + \frac{1}{x}\right)^3 = (3)^3$. What is the value of $x^3 + \frac{1}{x^3}$?

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$x^3 + 3x^2\left(\frac{1}{x}\right) + 3x\left(\frac{1}{x}\right)^2 + \frac{1}{x^3} = 27$$

$$x^3 + \frac{1}{x^3} + \underbrace{3x + 3\left(\frac{1}{x}\right)}_{9} = 27$$

$$x^3 + \frac{1}{x^3} = 18$$

9. Let $g(x) = g(-x)$ and $h(x) = -h(-x)$.
Show that $f(x)$ is even, odd, or neither.

$f(x) = -x^2 + 3g(x)$

$f(-x) = -(-x)^2 + 3g(-x)$

$= -x^2 + 3g(x) = f(x)$ $\boxed{\text{Even}}$

9. Let $g(x) = g(-x)$ and $h(x) = -h(-x)$.
Show that $f(x)$ is even, odd, or neither.

$$f(x) = \frac{h(x) - x}{g(x)}$$

$$f(-x) = \frac{h(-x) - (-x)}{g(-x)} = \frac{-h(x) + x}{g(x)}$$

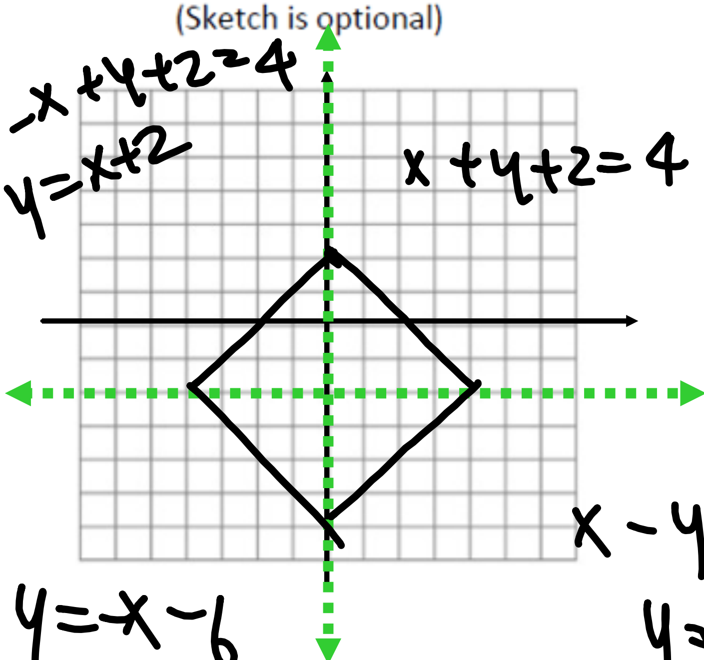
$$= -\left(\frac{h(x) - x}{g(x)}\right) = -f(x) \quad \boxed{\text{odd}}$$

7. Find the area enclosed by the graph of $|x| + |y+2| = 4$.
(Sketch is optional)

$-x+y+2=4$

$y=x+2$

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



$A = \frac{8 \cdot 8}{2} = \boxed{32}$

$x-y-2=4$

$y=x-6$

$y=-x-6$