

QC #1

$$(1) 5 - 3|10x + 8| < -1$$

$$-3|10x + 8| < -6$$

$$|10x + 8| > 2$$

$$10x + 8 > 2 \quad \text{or} \quad 10x + 8 < -2$$

$$\left\{ x \mid \begin{array}{l} 10x > -6 \\ x > -\frac{3}{5} \end{array} \quad \text{or} \quad \begin{array}{l} 10x < -10 \\ x < -1 \end{array} \right\}$$



positive < negative
| | < negative
no solution

| | > negative
all reals

$$(2) f(x) = \sqrt{3x + 4} \quad 3x + 4 \geq 0$$

$$3x \geq -4$$

$$\left\{ x \mid x \geq -\frac{4}{3} \right\}$$

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

$$x = \frac{1}{27^{2/3}} = \frac{1}{3^2} = \left(\frac{1}{9} \right)$$

condemal

$$(4) \log_2 \frac{x+3}{x} = 1$$

$$x \cdot 2^1 = \frac{x+3}{x}$$

$$2x = x + 3$$

$$x = 3$$

$$(5) u = 2x \\ v = 3$$

$$(2x - 3)(4x^2 + 6x + 9)$$

QC #2

① $(\sqrt{3x+4})^2 = (2 - \sqrt{x+2})^2 \rightarrow (2 - \sqrt{x+2})(2 - \sqrt{x+2})$

$$3x+4 = 4 - 4\sqrt{x+2} + (x+2)$$

$$3x+4 = 4 - 4\sqrt{x+2} + x+2$$

$$3x+4 = 2 + x - 4\sqrt{x+2}$$

~~$$(2x+2) = (-4\sqrt{x+2})^2$$~~

~~$$(2x-2)^2 = (-4\sqrt{x+2})^2$$~~

~~$$16x^2 + 16x + 4 = 16(x+2)$$~~

~~$$16x^2 + 16x + 4 = 16x + 32$$~~

~~$$16x^2 = 28$$~~

⑤ a) even
b) neither

stretch/down

$$4x^2 - 8x + 4 = 16(x+2)$$

$$4x^2 - 24x - 28 = 0$$

$$4(x^2 - 6x - 7) = 0$$

$$(x+1)(x-7) = 0$$

$x = -1, 7$ — extraneous

② $2x - 1 > 0$

$$2x > 1$$

$$\left\{ x \mid x > \frac{1}{2} \right\}$$

③ $\log_4(x+3) + \log_4(x-3) = 2$

$$\log_4(x+3)(x-3) = 2$$

$$4^2 = x^2 - 9$$

$$16 = x^2 - 9$$

$$25 = x^2$$

$$x = \pm 5$$

$$x = 5$$

④ $\log_a a^{x(x+3)} = x$
 $a^x = a^{x^2+3x}$

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

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

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

$$x = 0, -2$$

QC #3

E

① a) $D: \{x | x \in \mathbb{R}\}$ b) $D: \{x | x > 3\}$
 $R: \{y | y > -4\}$ $R: \{y | y \in \mathbb{R}\}$

② $(3^3)^{-x} \cdot 3^4 = (3^5)^{3-3x}$

$$-3x + 4 = 15 - 15x$$

$$12x = 11$$

$$x = \frac{11}{12}$$

③ $\left(\frac{1}{2}\right)^x = 16$

$$(2^{-1})^x = 2^4$$

$$-x = 4$$

$$x = -4$$

④ $|1-3x| > 5$

$$1-3x > 5 \quad \text{or} \quad 1-3x < -5$$

$$-3x > 4$$

$$-3x < -6$$

$$\left\{ x \mid x < -\frac{4}{3} \quad \text{or} \quad x > 2 \right\}$$

⑤ $9 + b\sqrt{m-b} + \sqrt{m-b} = m + 9$

$$b\sqrt{m-b} = b$$

$$\sqrt{m-b} = 1$$

$$m-b = 1$$

$$m = 7$$

square each side!

QC #4

① $\{x | x \in \mathbb{R}\}$

②
$$\frac{4 - 3(x+h)^2 - (4 - 3x^2)}{h}$$

$$\frac{4 - 3(x^2 + 2xh + h^2) - 4 + 3x^2}{h}$$

$$\frac{\cancel{4} - \cancel{3x^2} - 6xh - 3h^2 - \cancel{4} + \cancel{3x^2}}{h}$$

$$\frac{-6xh - 3h^2}{h}$$

$$-6x - 3h$$

③ $\pi^4 = \pi^{2x+3}$

$$\begin{array}{r} 4 = 2x + 3 \\ -3 \quad -3 \end{array}$$

$$1 = 2x$$

$$\frac{1}{2} = x$$

④ $\log_a x^{\frac{1}{2}} + \log_a y^3 - \log_a x^2$

$$\log_a x^{\frac{1}{2}} y^3 - \log_a x^2$$

$$\log_a \frac{x^{\frac{1}{2}} y^3}{x^2}$$

$$\log_a \left(\frac{y^3}{x^{\frac{3}{2}}} \right)$$

⑤ $x+1[(x+1)^2 - 4] = 0$

$$(x+1)(x+1-2)(x+1+2) = 0$$

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

$$x = -1, 1, -3$$

QC # 5

$$\textcircled{1} \quad x = \sqrt[3]{\frac{1}{4}y + 5}$$

$$x^3 = \frac{1}{4}y + 5$$

$$x^3 - 5 = \frac{1}{4}y$$

$$4(x^3 - 5) = y$$

$$4x^3 - 20 = y$$

$$f^{-1}(x) = 4x^3 - 20$$

$$\textcircled{3} \quad 8^{x^3} = 27$$

$$2^{3x^3} = 3^3$$

$$3x^3 = 3$$

$$x^3 = 1$$

$$x = 1$$

$$\textcircled{4} \quad \log_a 2x + \log_a \left(\frac{x}{y}\right)^3$$

$$\log_a (2x) + \log_a \frac{x^3}{y^3}$$

$$\log_a \left(\frac{2x^4}{y^3}\right)$$

$$\textcircled{2} \quad \sqrt{y+15} - 1 = \sqrt{2y+7}$$

$$(\sqrt{y+15} - 1)(\sqrt{y+15} + 1) = 2y+7$$

$$y+15 - 2\sqrt{y+15} + 1 = 2y+7$$

$$-2\sqrt{y+15} + y+16 = 2y+7$$

$$-2\sqrt{y+15} = y-9$$

$$4\sqrt{y+15} = y-9$$

$$4(y+15) = (y-9)(y-9)$$

$$4y+60 = y^2 - 18y + 81$$

$$0 = y^2 - 22y + 21$$

$$0 = (y-1)(y-21)$$

$$y = 1, \text{ } \cancel{y=21} \text{ extraneous}$$

$$\textcircled{5} \quad x^2(y^2+9) - 4(y^2+9)$$

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

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

QC #6

① $3x^{3n} + 24y^{6n}$

$3(x^{3n} + 8y^{6n})$

$u = x^n$
 $v = 2y^{2n}$

$3(x^n + 2y^{2n})(x^{2n} - 2x^n y^{2n} + 4y^{4n})$

$a = \sqrt{x}$

② $3x + \sqrt{x} - 4 = 0$

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

$(3a + 4)(a - 1) = 0$

$a = -\frac{4}{3}, 1$

~~$\sqrt{x} = -\frac{4}{3}$~~

$\sqrt{x} = 1$
 $x = 1$

③ $|\log_5 x| = 2$

$\log_5 x = 2$ or $\log_5 x = -2$

$5^2 = x$

$5^{-2} = x$

$25 = x$

or

$\frac{1}{25} = x$

④ $\log_5 \sqrt{x^2 + 1} = 1$

$(5^1)^2 = (\sqrt{x^2 + 1})^2$

$25 = x^2 + 1$
 $-1 \quad -1$

$\sqrt{24} = \sqrt{x^2}$
 $x = \pm 2\sqrt{6}$

QC #6

⑤

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

$$f(x+h) = -(x+h)^2 + 5$$

$$= -(x^2 + 2xh + h^2) + 5$$

$$= -x^2 - 2xh - h^2 + 5$$

$$\frac{f(x+h) - f(x)}{h} = \frac{-x^2 - 2xh - h^2 + 5 - (-x^2 + 5)}{h}$$

$$= \frac{-x^2 - 2xh - h^2 + 5 + x^2 - 5}{h}$$

$$= \frac{-2xh - h^2}{h} = \frac{h(-2x - h)}{h} = \boxed{-2x - h}$$

QC #7

① a) $y = 2\left(\frac{1}{2}\right)^{-x+2} + 1 \rightarrow \text{exp.} \mid \text{down } 1$

$$D: \{x \mid x \in \mathbb{R}\}$$

$$R: \{y \mid y\}$$

b) $\log \rightarrow \log_3 \left[\frac{1}{2}(x+4) \right] - 1 \rightarrow \text{horiz stretch } 2, \text{ left } 4$

$$D: \{x \mid x > -4\}$$

$$R: \{y \mid y \in \mathbb{R}\}$$

QC#1

cont'd

$$\textcircled{2} \quad \begin{array}{l} \ln 2x = 2 - \ln 3 \\ + \ln 3 \quad + \ln 3 \end{array}$$

$$\begin{array}{l} \ln 2x + \ln 3 = 2 \\ \ln_e b x^{\leftarrow} = 2 \end{array}$$

$$\frac{e^2}{b} = \frac{bx}{b}$$

$$\boxed{x = \frac{e^2}{b}}$$

$$\textcircled{3} \quad e^1 \cdot e^{x+1} = 3$$

$$e^{x+2} = 3$$

$$\begin{array}{l} \ln 3 = x+2 \\ e^{-2} \quad -2 \end{array}$$

$$\boxed{(\ln 3) - 2 = x}$$

$$\textcircled{4} \quad 16^x \cdot 8^x = 3$$

$$(2^4)^x \cdot (2^3)^x = 3$$

$$2^{4x} \cdot 2^{3x} = 3$$

$$2^{7x} = 3$$

$$\begin{array}{l} \log_2 3 = 7x \\ \frac{1.585}{7} = \frac{7x}{7} \end{array}$$

⑤

$$(2xy - x^2y)(-6 + 3x)$$

$$xy(2-x) - 3(2-x)$$

$$\boxed{(2-x)(xy-3)}$$

$$\boxed{x = 0.2264}$$