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Simplify each radical.

1) $\frac{3}{4}\sqrt[3]{-40}$ $<\frac{10}{4<2}$

$$\boxed{\frac{3}{2}i\sqrt{10}}$$

2) $6i\sqrt{-36}$

$6i(6i) = 36i^2$

$= \boxed{-36}$

3) $\sqrt[3]{-32x^7}$

$\boxed{-2x^2(\sqrt[3]{4x})}$

Find the values of x and y that make each equation true.

4) $-4(x-5)-(18yi) = 28+45i$

$-4(x-5) = 28$

$-4x+20 = 28$

$-4x = 8$

$\boxed{x=-2}$

$-18y = 45$

$\boxed{y = -5/2}$

Simplify the following.

5) $-4i^{19}$

$-4(-i) = \boxed{4i}$

6) $7+i^{20}+4i^{14}$

$7+1+4(-1)$

$8-4 = \boxed{4}$

7) $8i^{25}-2i^{55}$

$8i - 2(-i)$

$8i+2i = \boxed{10i}$

Simplify.

8) $(9-4i)-5(1+8i)$

$9-4i-5-40i$

$\boxed{4-44i}$

9) $(-3+10i)(1+2i)^2$

$(-3+10i)(1+2i)(1+2i)$

$(-3+10i)(1+4i \mp 4i^2)$

$(-3+10i)(-3+4i)$

$9-12i-30i \mp 40i^2$

$\boxed{-31-42i}$

10) $-4(5i-2)+7i(-9-2i)$

$-20i+8-63i \pm 14i^2$

$\boxed{22-83i}$

11) $\frac{5-2i}{1+7i} \cdot \frac{(1-7i)}{(1-7i)}$

$= \frac{5-35i-2i \mp 14i^2}{1-7i+7i+49i^2} = \boxed{\frac{-9-37i}{50}}$

Simplify.

12) $\sqrt[4]{90x^{11}y^{20}}$

9 10
3·3 5·2

$\boxed{x^2y^5\left(\sqrt[4]{90\,x^3}\right)}$

13) $\sqrt[3]{\dfrac{32}{27p^{12}}}$ $8\sqrt[3]{\dfrac{4}{2}}$

$\boxed{\dfrac{2\sqrt[3]{4}}{3p^4}}$

14) $\dfrac{125^{\frac{8}{3}}}{125^{\frac{10}{3}}} = 125^{-2/3}$

$= \dfrac{1}{125^{2/3}} = \dfrac{1}{\sqrt[3]{125}^2}$

$= \dfrac{1}{5^2} = \boxed{\dfrac{1}{25}}$

15) $\sqrt[5]{x^8}\cdot(xy^{20})^{\frac{3}{4}}$

$x^{8/5}\cdot x^{3/4}\cdot y^{15}$
$x^{32/20}\quad x^{15/20}$

$\boxed{x^{47/20}y^{15}}$

16) $\dfrac{\sqrt[6]{x^8}}{x} = \dfrac{x^{8/6}}{x^{6/6}} = x^{2/6}$

$= \boxed{x^{1/3}}$

17) $(-8)^{\frac{-5}{3}} = \dfrac{1}{(-8)^{5/3}} = \dfrac{1}{\sqrt[3]{-8}^5}$

$= \dfrac{1}{(-2)^5}$

$= \boxed{\dfrac{1}{-32}}$

18) $\sqrt{\dfrac{10x^9}{35x^4}} = \dfrac{\sqrt{2x^5}}{\sqrt{7}}\cdot\dfrac{\sqrt{7}}{\sqrt{7}}$

$= \dfrac{\sqrt{14x^5}}{7}$

$= \boxed{\dfrac{x^2\sqrt{14x}}{7}}$

19) $\sqrt[3]{\dfrac{x^{27}}{5}} = \dfrac{\sqrt[3]{x^{27}}}{\sqrt[3]{5}}\cdot\dfrac{\sqrt[3]{25}}{\sqrt[3]{25}}$

$= \dfrac{\sqrt[3]{25x^{27}}}{5}$

$= \boxed{\dfrac{x^9\left(\sqrt[3]{25}\right)}{5}}$

20) $(8x^6)^{\frac{1}{3}}\cdot(9x^{10})^{\frac{1}{2}}$

$8^{1/3}x^2\cdot 9^{1/2}x^5$

$2x^2\cdot 3x^5$

$\boxed{6x^7}$

Factor Completely.

1) $x^4 - 16$

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

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

2) $54x^2 - 3x - 2$

$\dfrac{-108}{-12 \diagdown 9}$
$\diagup -3$

$(54x^2 - 12x)(9x - 2)$

$6x(9x - 2) \ 1(9x - 2)$

$(6x + 1)(9x - 2)$

3) $-x^6 - 10x^5 - 21x^4$

$-x^4(x^2 + 10x + 21)$

$-x^4(x + 3)(x + 7)$

4) $12x^4 - 111x^2 + 189$

$\dfrac{252}{-28 \diagdown -9}$
$\diagup -37$

$3(4x^4 - 37x^2 + 63)$

$(4x^4 - 28x^2)(-9x^2 + 63)$

$4x^2(x^2 - 7) - 9(x^2 - 7)$

$3(4x^2 - 9)(x^2 - 7)$

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

5) $32x^3 - 80x^2 + 50x$

$2x(16x^2 - 40x + 25)$

$2x(4x - 5)^2$

6) $x^{14} - 12x^7 + 27$

$(x^7 - 9)(x^7 - 3)$

Write a polynomial equation with the following roots.

7) $-\frac{1}{4}, 0, \& 6$

$x(4x + 1)(x - 6) = 0$

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

$4x^3 - 24x^2 + x^2 - 6x = 0$

$4x^3 - 23x^2 - 6x = 0$

8) 3 $mult$ of 2 & -7

$(x - 3)(x - 3)(x + 7) = 0$

$(x^2 - 6x + 9)(x + 7) = 0$

$x^3 + 7x^2 - 6x^2 - 42x + 9x + 63 = 0$

$x^3 + x^2 - 33x + 63 = 0$

Solve the following using the method of your choice: factoring, completing the square, square root method, or quadratic formula.

9) $\frac{3}{4}(x-3)^2 = 9$

$(x-3)^2 = 12$

$x - 3 = \pm 2\sqrt{3}$

$\boxed{x = 3 \pm 2\sqrt{3}}$

10) $16x^2 + 48x + 36 = 0$

$4(4x^2 + 12x + 9) = 0$

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

$\boxed{x = -3/2 \text{ mult. of } 2}$

11) $-3x^2 + 11x - 10 = 0$

$-(3x^2 - 11x + 10) = 0$

30 -5 -6 -11

$(3x^2 - 5x)(-6x + 10)$

$x(3x-5) - 2(3x-5)$

$-(x-2)(3x-5) = 0$

$\boxed{x = 2, 5/3}$

12) $-x^5 = -4x^3 - 45x$

$0 = x^5 - 4x^3 - 45x$

$0 = x(x^4 - 4x^2 - 45)$

$0 = x(x^2 - 9)(x^2 + 5)$

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

$\boxed{x = 0, \pm 3, \pm i\sqrt{5}}$

13) $81x^2 + 90x = -25$

$81x^2 + 90x + 25 = 0$

$(9x+5)^2$

$\boxed{x = -5/9 \text{ mult of } 2}$

14) $x^2 + 4 = -3x$

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

$x = \dfrac{-3 \pm \sqrt{9 - 4(1)(4)}}{2(1)}$

$= \dfrac{-3 \pm \sqrt{-7}}{2} = \boxed{\dfrac{-3 \pm i\sqrt{7}}{2}}$

15) $12x^2 - 27 = 0$

$3(4x^2 - 9) = 0$

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

$\boxed{x = \pm 3/2}$

16) $x^5 + 12x^4 + 11x^3 = 0$

$x^3(x^2 + 12x + 11) = 0$

$x^3(x+11)(x+1) = 0$

$\boxed{x = 0 \text{ mult of } 3, -11, -1}$

Determine x and y intercepts of the following functions:

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

x-int:

$-\frac{1}{4}(x+4)^2 + 1 = 0$

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

$(x+4)^2 = 4$

$x+4 = \pm 2$

$x = -2, -6$ $(-2,0)$ & $(-6,0)$

y-int:

$y = -\frac{1}{4}(0+4)^2 + 1$

$y = -4 + 1 = -3$

$(0,-3)$

2) $f(x) = 6x^2 + 4x - 1$

x-int:

$x = \dfrac{-4 \pm \sqrt{16 - 4(6)(-1)}}{2(6)}$

$= \dfrac{-4 \pm \sqrt{40}}{12} = \dfrac{-4 \pm 2\sqrt{10}}{12}$

$= \left(\dfrac{-2 \pm \sqrt{10}}{6}, 0\right)$

y-int:

$(0,-1)$

Determine whether the given functions have a maximum or a minimum and where it is.

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

$x = \dfrac{16}{2(-4)} = \dfrac{16}{-8} = -2$

$V: (-2, 19)$

max @ y = 19

4) $f(x) = (x+7)^2 + 5$

$V: (-7, 5)$

min @ y = 5

Determine the end behavior of the following functions.

5) $f(x) = -\frac{1}{5}(x+2)^2 - 8$

As $x \to -\infty$, $f(x) \to -\infty$

As $x \to \infty$, $f(x) \to -\infty$

6) $f(x) = 3x^2 + x + 7$

As $x \to -\infty$, $f(x) \to \infty$

As $x \to \infty$, $f(x) \to \infty$

List the transformations of the following functions.

7) $f(x) = (-5x)^2 - 1$

· reflect over y-axis
· h. Shrink by 1/5
· down 1

8) $f(x) = -\frac{1}{3}(x-9)^2$

· reflect over x-axis
· V. Shrink by 1/3
· right 9

Rewrite the following into vertex form (#9) or standard form (#10)

9) $f(x) = -4x^2 + 8x - 1$

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

$y - 3 = -4(x-1)^2$

$y = -4(x-1)^2 + 3$

10) $f(x) = 2(x-5)^2 + 8$

$y = 2(x-5)(x-5) + 8$

$y = 2(x^2 - 10x + 25) + 8$

$y = 2x^2 - 20x + 50 + 8$

$y = 2x^2 - 20x + 58$

Determine the domain and range of:

11) Question #9 $y = -4(x-1)^2 + 3$

D: $\mathbb{R}$

R: $y \le 3$

12) Question #10 $y = 2(x-5)^2 + 8$

D: $\mathbb{R}$

R: $y \ge 8$

Use the information provided to write the standard form equation of each circle.

1) Center: $(-14, -8)$
   Radius: $3\sqrt{2}$

$(x+14)^2 + (y+8)^2 = 18$

2) Center: $\left(-\dfrac{17}{2}, 2\sqrt{22}\right)$
   Radius: 8

$(x + 17/2)^2 + (y - 2\sqrt{22})^2 = 64$

3) $\dfrac{3x^2 + 3y^2 - 60y + 57 = 0}{3}$

$x^2 + y^2 - 20y + 100 = -19 + 100$

$x^2 + (y - 10)^2 = 81$

4) Center: $(-5, -11)$
   Point on Circle: $(-10, -14)$

$r = \sqrt{(-10-5)^2 + (-14=11)^2}$
$= \sqrt{25+9} = \sqrt{34}$

$(x+5)^2 + (y+11)^2 = 34$

Use the information provided to write the general conic form equation of each circle.

5) Center: $(-5, -8)$
   Radius: 8

$(x+5)^2 + (y+8)^2 = 64$
$x^2 + 10x + 25 + y^2 + 16y + 64 = 64$
$x^2 + y^2 + 10x + 16y + 25 = 0$

6) Center: $(-7, 10)$
   Area: 9π

$9\pi = \pi r^2$
$r^2 = 9$

$(x+7)^2 + (y-10)^2 = 9$
$x^2 + 14x + 49 + y^2 - 20y + 100 = 9$
$x^2 + y^2 + 14x - 20y + 140 = 0$

Identify the center and radius of each. Then sketch the graph.
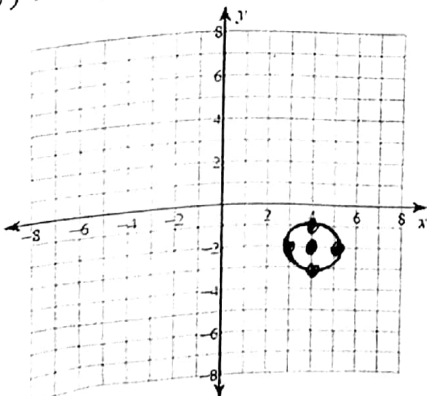
7) $x^2 + y^2 - 8x + 4y + 19 = 0$

$x^2 - 8x + 16 + y^2 + 4y + 4 = -19 + 16 + 4$

$(x-4)^2 + (y+2)^2 = 1$

C: $(4, -2)$

$r = 1$

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Choose your own method to solve each equation. Be sure to use different methods.

1) $n^2 - 6n + 10 = 5$

$n^2 - 6n + 5 = 0$

$(n-5)(n-1) = 0$

$\boxed{n = 5, 1}$

2) $2a^2 + 12a + 52 = 10$

$2a^2 + 12a + 42 = 0$

$2(a^2 + 6a + 21) = 0$

$a^2 + 6a + \dfrac{9}{} = -21 + \dfrac{9}{}$

$\sqrt{(a+3)^2} = \sqrt{-12}$

$a + 3 = \pm 2i\sqrt{3}$

$\boxed{a = -3 \pm 2i\sqrt{3}}$

3) $10x^2 - 20x = 70$

$10x^2 - 20x - 70 = 0$

$10(x^2 - 2x - 7) = 0$

$x^2 - 2x + 1 = 7 + 1$

$\sqrt{(x-1)^2} = \sqrt{8}$

$x - 1 = \pm 2\sqrt{2}$

$\boxed{x = 1 \pm 2\sqrt{2}}$

4) $5x^2 = -25 + 20x$

$5x^2 - 20x + 25 = 0$

$5(x^2 - 4x + 5) = 0$

$x = \dfrac{4 \pm \sqrt{16 - 4(1)(5)}}{2(1)} = \dfrac{4 \pm \sqrt{-4}}{2}$

$= \dfrac{4 \pm 2i}{2}$

$= \boxed{2 \pm i}$

5) $k^2 - 5k = 0$

$k(k-5) = 0$

$\boxed{k = 0, 5}$

6) $5x^2 + 25x = -20$

$5x^2 + 25x + 20 = 0$

$5(x^2 + 5x + 4) = 0$

$5(x+4)(x+1) = 0$

$\boxed{x = -4, -1}$

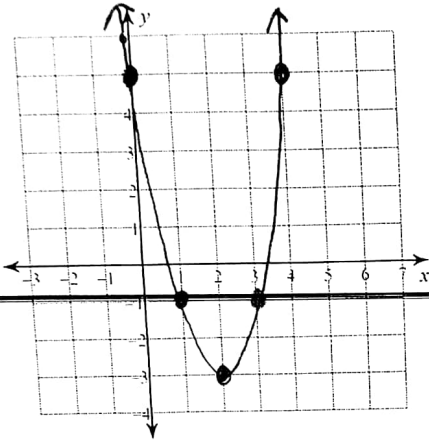**Find the x and y intercept(s).**

7) $f(x) = 8x^2 - 8x - 8$

x-int:

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

$x^2 - x - 1 = 0$

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

$= \boxed{\left(\dfrac{1 \pm \sqrt{5}}{2}, 0\right)}$

y-int:

$\boxed{(0, -8)}$

8) $f(x) = 4x^2 - 3x - 22$

x-int:

$4x^2 - 3x - 22 = 0$

$\overset{-11}{} \diagdown \overset{8}{} \diagup \overset{-88}{}$ $/-3$

$(4x^2 - 11x)(8x - 22)$

$x(4x - 11) \, 2(4x - 11)$

$(x + 2)(4x - 11) = 0$

$x = -2, \ ^{11}/_4$

$\boxed{(-2, 0) \, \& \, (^{11}/_4, 0)}$

y-int:

$\boxed{(0, -22)}$

-1-

Find the following: Direction, axis of symmetry, vertex, x -intercepts, y - intercept, range, end behavior, maximum, minimum, interval of increase, interval of decrease and rate of change between x =1 and x=3.

9) $f(x) = 2x^2 - 8x + 5$

$X = \dfrac{8}{2(2)} = \dfrac{8}{4} = 2$

10) $f(x) = -2x^2 + 12x - 16$

$X = \dfrac{-12}{2(-2)} = \dfrac{-12}{-4} = 3$

X	y
0	5
1	-1
2	-3
3	-1
4	5

X	y
1	-6
2	0
3	2
4	0
5	-6

Direction: up

AOS: $X = 2$

V: $(2, -3)$

X-int: $\left(\dfrac{4 \pm \sqrt{6}}{2}, 0\right)$

$X = \dfrac{8 \pm \sqrt{64 - 4(2)(5)}}{2(2)}$

$= \dfrac{8 \pm \sqrt{24}}{4}$

$= \dfrac{8 \pm 2\sqrt{6}}{4}$

$= \dfrac{4 \pm \sqrt{6}}{2}$

y - Int: $(0, 5)$

R: $y \geq -3$

EB: AS $x \to -\infty, f(x) \to \infty$
    AS $x \to \infty, f(x) \to \infty$
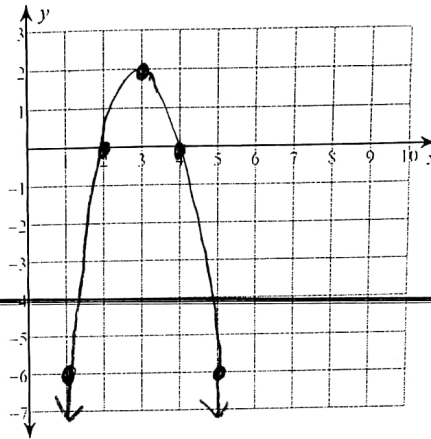
min @ $y = -3$

inc: $(2, \infty)$

Dec: $(-\infty, 2)$

Roc: 0

$(1, -1) (3, -1)$

$\dfrac{-1 - 1}{3 - 1} = \dfrac{0}{2}$

Direction: down

AOS: $X = 3$

V: $(3, 2)$

X-int: $(2, 0)(4, 0)$

y - int: $(0, -16)$

R: $y \leq 2$

EB: AS $x \to -\infty, f(x) \to -\infty$
    AS $x \to \infty, f(x) \to -\infty$

max @ $y = 2$

inc: $(-\infty, 3)$

Dec: $(3, \infty)$

Roc: 4

$(1, -6) (3, 2)$

$\dfrac{2 - 6}{3 - 1} = \dfrac{8}{2} = 4$