1. The value of $y-3[2x-4(3x-y)]$ when $x=\dfrac{1}{5}$ and $y=-\dfrac{1}{11}$ is:

~~(a)~~ 7

(b) -5

(c) 3

(d) -3

(e) -7

See example 9 p.13 and problems 105, 106 p.17

$y-3[2x-12x+4y]$

$y-3[-10x+4y]$

$y-3(-10x+4y)$

$y+30x-12y$

$30x-11y$

at $x=\frac{1}{5}$ & $y=-\frac{1}{11}$

$=30\left(\frac{1}{5}\right)-11\left(-\frac{1}{11}\right)$

$=6+1=\boxed{7}$

2. If $f(x)=3-2[1-x]$, where $[x]$ is the greatest integer function, then the value of $f\left(\dfrac{9}{2}\right)$ is equal to

~~(a)~~ 11

(b) 13

(c) 9

(d) -4

(e) -5

See problems 43 to 46 p. 191

Sec 2.2

$f\left(\frac{9}{2}\right)=3-2\left[\!\left[1-\frac{9}{2}\right]\!\right]=3-2\left[\!\left[-3.5\right]\!\right]$

$=3-2(-4)=3+8=11$

3. The **sum** of all solutions of the equation

$$(x+1)^{2/3} = (x+1)^{1/3} + 6$$

is

(a) 17

(b) -13

(c) -26

(d) 15

(e) 0

See example 9 p. 124

and problems 49, 50 p. 126

Let $y = (x+1)^{1/3}$ $y^2 = y + 6$

$y^2 - y - 6 = 0$

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

$y = 3$ or $y = -2$

$(x+1)^{1/3} = 3$

$x + 1 = 27$

$\boxed{x_1 = 26}$

$(x+1)^{1/3} = -2$

$x + 1 = -8$

$x_2 = -9$

$x_1 + x_2 = 26 - 9 = \boxed{17}$

4. If $y - b = m(x - a)$, then x is equal to

(a) $\dfrac{y - b + ma}{m}$

(b) $my - ba + a$

(c) $\dfrac{y - b + a}{m}$

(d) $y - b + ma$

(e) $\dfrac{m + ay - ab}{y - b}$

See example 1 p. 91

and problems 1 to 10 p. 98

$y - b = m(x - a)$

$\dfrac{y-b}{m} = x - a$

$x = \dfrac{y-b}{m} + a$

$$\boxed{x = \frac{y - b + ma}{m}}$$

5. The **sum** of all **solutions** of the equation

$$\frac{5}{3} - 4|3x-6| = -\frac{19}{3}$$

is equal to

~~(a)~~ 4

(b) 6

(c) 3

(d) 2

(e) 12

See example 5 p. 86

and problems 33 to 48 p. 88

$$\frac{5}{3} + \frac{19}{3} = 4|3x-6| = 4|3(x-2)|$$

$$\frac{24}{3} = 12|x-2| \quad \div 2$$

$$\frac{2}{3} = |x-2| \Rightarrow x-2 = \frac{2}{3} \text{ or } x-2 = -\frac{2}{3}$$

$$x = 2 + \frac{2}{3} \quad \text{or} \quad x = 2 - \frac{2}{3}$$

$$= \frac{8}{3} \qquad x = \frac{4}{3}$$

$$\text{Sum} = \frac{12}{3} = \boxed{4}$$

6. If $i = \sqrt{-1}$ and $z = \dfrac{7-3i}{1+i} - i^{51}$, then the **conjugate** of z in standard form is

~~(a)~~ $\bar{z} = 2 + 4i$

(b) $\bar{z} = 2 + 6i$

(c) $\bar{z} = -2 - 4i$

(d) $\bar{z} = -2 + 4i$

(e) $\bar{z} = 2 - 6i$

See examples 4 and 5 p. 70-71

and problems 41 to 62 p. 72

$$z = \frac{7-3i}{1+i} \cdot \frac{(1-i)}{1-i} - i^{33}$$

$$= \frac{7 - 7i - 3i + 3i^2}{1+1} - (-i)$$

$$= \frac{4 - 10i}{2} + i = 2 - 5i + i$$

$$z = 2 - 4i$$

The conjugate is

$$\boxed{\bar{z} = 2 + 4i}$$

7. The **sum** of the **real part** and the **imaginary part** of the complex number $z = 3(2+5i) - 2i(2-3i) + \sqrt{-12}\cdot\sqrt{-27}$, where $i = \sqrt{-1}$, is equal to

(a) -7

(b) -5

(c) $29i$

(d) $-7i$

(e) 5

See problems 13 to 26 p. 72

$$Z = 6 + 15i - 4i + 6i^2 + (i\sqrt{12})(i\sqrt{27})$$

$$= \cancel{6} + 15i - 4i - \cancel{6} - \sqrt{2^2 . 3 . 3^3}$$

$$= 11i - 2 . 3^2 = -18 + 11i$$

$$Re + Im = (-18) + 11 = \boxed{-7}$$

8. Which one of the following sets of ordered pairs (x, y) or relations defines y as a function of x?

(a) $\{(-3,0), (0,0), (1,0), (7,0)\}$

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

(c) $\left\{(-100,1), \left(0,-\frac{1}{2}\right), \left(0,\frac{1}{2}\right), (100,-1)\right\}$

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

(e) $\sqrt{x^2-y^2} = 4$

See example 3 p. 181 and problems 11 to 26 p. 191

Sec 2.2 functions.

9. The rational expression $\dfrac{\dfrac{2y^2-5y-12}{(y-6)(y-4)}}{\dfrac{(2y-3)(2y+3)}{y^2-9y+18}}$ simplifies to

(a) $\dfrac{y-3}{2y-3}$

(b) $\dfrac{2y+3}{y-3}$

(c) $\dfrac{2y-3}{y-3}$

(d) $\dfrac{y-3}{2y+3}$

(e) $\dfrac{(y-4)(y-3)}{(y-12)(y-2)}$

See example 2 p.58

and problems 57, 58 p. 63

$$\frac{2y^2-5y-12}{(y-6)(y-4)} \cdot \frac{y^2-9y+18}{(2y-3)(2y+3)}$$

$$= \frac{\cancel{(2y+3)}\cancel{(y-4)}}{\cancel{(y-6)}\cancel{(y-4)}} \cdot \frac{(y-3)\cancel{(y-6)}}{(2y-3)\cancel{(2y+3)}}$$

$$= \boxed{\frac{y-3}{2y-3}}$$

10. If the distance between the points $A(x+4, 2x)$ and $B(x, -1)$ is 5, then the value of $3x-1$ when $x>0$ is equal to

(a) 2

(b) 6

(c) 5

(d) 3

(e) 0

See problems 15, 16 p. 174

Sec 2.1

11. The circle $x^2+y^2-3x+2y+1=0$ [Hint: sketch]

~~(a)~~ touches the y-axis only

(b) touches the x-axis only

(c) touches both the x- and y-axes

(d) lies completely above the x-axis

(e) lies completely below the x-axis

See example 7 p.173
and problems 69 to 72 p.175
and problem 76 p.175
and problems 95, 96 p.176

Sec 2.1

12. The equation $\dfrac{2}{x+2}+\dfrac{3}{x-2}=\dfrac{12}{x^2-4}$ is

~~(a)~~ a contradiction

(b) conditional

(c) an identity

(d) equivalent to the equation $x=2$

(e) equivalent to the equation $3x+1=0$

see example 4 p.85
and problems 23 to 32 p.88

LCD $= x^2-4$
Multiply by LCD

$2(x-2)+3(x+2)=12$

$5x+2=12$

$5x=12-2=10$

$\boxed{x=\frac{10}{5}=2}$

Check

$\frac{2}{2+2}+\frac{3}{2-2}=\frac{12}{2^2-4}$

undef.

$SS=\phi \Rightarrow$

Contradiction.

13. The width of a rectangle is 2 meters more than half the length of the rectangle. If the perimeter of the rectangle is 120 meters, then its **width** is equal to

(a) $\frac{64}{3}$ meters

(b) $\frac{55}{3}$ meters

(c) $\frac{73}{3}$ meters

(d) 20 meters

(e) 23 meters

See example 3 p.93

and problems 19, 20 p.99

$W = \frac{L}{2} + 2$ $\quad 2(L+W) = 120$

$\Rightarrow L + W = 60 \Rightarrow L + \frac{L}{2} + 2 = 60$

$\frac{3L+4}{2} = 60 \Rightarrow 3L + 4 = 120$

$3L = 116 \Rightarrow L = \frac{116}{3}$

$W = \frac{L}{2} + 2 = \frac{116}{3 \cdot 2} + 2 = \frac{58}{3} + \frac{6}{3}$

$= \frac{64}{3}$

14. If the discriminant of the equation

$$\sqrt{2}x^2 + kx + \frac{\sqrt{2}}{5} = 0$$

is equal to $\frac{8}{45}$, then a possible value of k is

(a) $\frac{4}{3}$

(b) $\frac{2}{3}$

(c) $\frac{1}{3}$

(d) $\frac{5}{3}$

(e) 3

See example 6 p.109

and problems 47 to 56 p.113

$\Delta = b^2 - 4ac = k^2 - 4(\sqrt{2})\frac{\sqrt{2}}{5} = \frac{8}{45}$

$k^2 - \frac{8}{5} = \frac{8}{45}$

$k^2 = \frac{8}{45} + \frac{8}{5} = \frac{8}{45} + \frac{9 \times 8}{45} = \frac{\cancel{10}^{2}(8)}{\cancel{45}_{9}} = \frac{16}{9}$

$k = \pm\frac{4}{3}$

15. The expression $\dfrac{6x-27}{3-\sqrt{18-2x}}$ simplifies to

(a) $3[3+\sqrt{18-2x}]$

(b) $-9[3+\sqrt{18-2x}]$

(c) $\frac{1}{6}[3+\sqrt{18-2x}]$

(d) $9[3+\sqrt{18-2x}]$

(e) $-[3+\sqrt{18-2x}]$

See example 9 P. 31

and problems 107 to 112 P. 33

$$\frac{(6x-27)}{3-\sqrt{18-2x}} \cdot \frac{(3+\sqrt{18-2x})}{(3+\sqrt{18-2x})}$$

$$= \frac{18x + 6x\sqrt{18-2x} - 81 - 27\sqrt{18-2x}}{9-(18-2x)}$$

$$= \frac{3(2x-9)\sqrt{18-2x} + 9(2x-9)}{(-9+2x)}$$

$$= \frac{\cancel{(2x-9)}(3\sqrt{18-2x}+9)}{\cancel{(2x-9)}} = 3(3+\sqrt{18-2x})$$

16. If A is the leading coefficient and B is the coefficient of x in the polynomial

$$P(x) = (2x-3)^3 - (3x-2)^2,$$

then $A+B=$

(a) 74

(b) 82

(c) 64

(d) 38

(e) 56

See example 1 P. 36

and problems 11 to 16 P. 41

and problems 84 to 89 P. 43

~~A=2~~

$$P(x) = (2x)^3 - 3(2x)^2\,3 + 3(2x)3^2 - 3^3$$

$$-\left((3x)^2 - 2(3x)(2) + 4\right)$$

Highest degree term $= 8x^3$

term with x $= 54x + 12x = 66x$

$A = 8$ $B = 66$

$A + B = \boxed{74}$

17. $\dfrac{1}{x^2+3x+2} - \dfrac{1}{x^2-2x-3} =$

(a) $\dfrac{-5}{(x+1)(x+2)(x-3)}$

(b) $\dfrac{3}{(x+1)^2(x+2)(x-3)}$

(c) $\dfrac{-9}{(x+1)(x+2)(x-3)}$

(d) $\dfrac{2x+1}{(x+1)^2(x+2)(x-3)}$

(e) $\dfrac{-12}{(x+1)(x+2)(x-3)}$

See example 3 P.59

and problems 25 to 32 P. 63

$\dfrac{1}{(x+2)(x+1)} - \dfrac{1}{(x-3)(x+1)}$

LCD = $(x+2)(x+1)(x-3)$

$= \dfrac{(x-3) - (x+2)}{(x+2)(x+1)(x-3)}$

$= \dfrac{-5}{(x+2)(x+1)(x-3)}$

18. The domain, in interval notation, of the function $f(x) = \dfrac{16}{\sqrt{x^2+4x+12}}$ is equal to

(a) $(-\infty, \infty)$

(b) $(-\infty, -6) \cup (-2, \infty)$

(c) $(-6, -2)$

(d) $(-\infty, -6) \cup (2, \infty)$

(e) $(-\infty, -2) \cup (6, \infty)$

See example 4 P. 182

and problems 27 to 38 P. 191

Sec 2.2

$x^2 + 4x + 12 > 0$

$\Delta = 16 - 4(12) < 0$

no real solutions

$\Rightarrow$ sign$(x^2+4x+12)$ = sign(a) = sign(1) = $+$

$x^2 + 4x + 12$ is always positive

$\Rightarrow \mathcal{D} = \mathbb{R}$

19. The solution set, in interval notation, of the inequality

$$\frac{-x^2+x+6}{(x+1)(x^2+1)} \le 0$$

is equal to

See problems 47 to 50 P.140

~~(a)~~ $[-2,-1) \cup [3,\infty)$

(b) $[-3,-1) \cup [2,\infty]$

(c) $[-3,-2] \cup (-1,\infty)$

(d) $(-\infty,-3] \cup [-2,-1)$

(e) $(-\infty,-2] \cup (-1,3]$

$$\Longleftrightarrow \frac{x^2-x-6}{(x+1)(x^2+1)} \geqslant 0$$

$$\frac{(x-3)(x+2)}{(x+1)(x^2+1)} \geqslant 0$$

(x^2+1) has no zeros & is always posi

		-2		-1		3	
$x-3$	$-$		$-$		$-$	0	$+$
$x+2$	$-$	0	$+$		$+$		$+$
$x+1$	$-$		$-$	0	$+$		$+$
	$-$	0	$+$	U	$-$	0	$+$

$SS = [-2,-1) \cup [3,\infty)$

20. One of the factors of $16x^2 - 25y^2 + 24x + 9$ is

See problems 81, 82 p.54

~~(a)~~ $4x - 5y + 3$

(b) $4x + 5y - 3$

(c) $2x - 5y + 3$

(d) $4x + 5y + 9$

(e) $8x - y + 3$

$\cancel{(16x^2 - 25y^2) + (24x + 9)}$

$\cancel{(4x - 5y)(}$

$16x^2 + 24x + 9 \quad - 25y^2$

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

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

21. The expression $(1+x^3)^{-1}+(1+x^{-3})^{-1}$ simplifies to

(a) 1

(b) $2+x^3+x^{-3}$

(c) $\dfrac{2}{1+x^3}$

(d) $\dfrac{2x^3}{1+x^3}$

(e) $2(1+x^3)$

See problems 59 to 62 P. 64

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

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

22. If $|3-2x|\le 5$ is equivalent to $m\le 5x+2\le n$, then

(a) $m=-3$ and $n=22$

(b) $m=7$ and $n=22$

(c) $m=-23$ and $n=27$

(d) $m=-2$ and $n=27$

(e) $m=4$ and $n=11$

See example 3 p.132
and problems 17 to 24 P. 140

$|2x-3|\le 5$

$-5\le 2x-3\le 5$

$-2=-5+3\le 2x\le 5+3=8$

$-1\le x\le 4$

$m\le 5x+2\le n$

$m-2\le 5x\le n-2$

$\dfrac{m-2}{5}\le x\le \dfrac{n-2}{5}$

$\Rightarrow \dfrac{m-2}{5}=-1$ & $\dfrac{n-2}{5}=4$

$m-2=-5$ $\quad$ $n-2=20$

$\boxed{m=-3}$ $\quad$ $\boxed{n=22}$

23. When rationalized, the expression $\dfrac{2xy}{\sqrt[5]{64x^7y^8}}$ is equal to

(a) $\dfrac{\sqrt[5]{16x^3y^2}}{2xy}$

(b) $\sqrt[5]{2xy}$

(c) $\dfrac{\sqrt[5]{4xy^2}}{2xy}$

(d) $\dfrac{\sqrt[5]{8x^2y^3}}{2xy}$

(e) $\dfrac{1}{\sqrt[5]{2xy}}$

See problems 103 to 106 p.33

See also example 6 p.30

$$\frac{2xy}{\sqrt[5]{2^6x^5x^2y^5\cdot y^3}} = \frac{\cancel{2xy}}{\cancel{2xy}\sqrt[5]{2x^2y^3}} = \frac{1}{\sqrt[5]{2x^2y^3}}$$

$$= \frac{\cancel{2xy}\cdot\sqrt[5]{2^4x^3y^2}}{\sqrt[5]{2x^2y^3}\cdot\sqrt[5]{2^4x^3y^2}} = \frac{\sqrt[5]{2^4x^3y^2}}{\sqrt[5]{2^5x^5y^5}}$$

$$= \boxed{\frac{\sqrt[5]{16x^3y^2}}{2xy}}$$

24. If $-1 < x < 1$, then the expression

$$|x^2+2| + |x^2-2| + \sqrt{(x-2)^2}$$

simplifies to

(a) $6-x$

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

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

(d) $2-x$

(e) $x+2$

See problems 31 to 40 p.16

$x^2+2>0 \Rightarrow |x^2+2| = x^2+2$

$(x^2-2)<0 \Rightarrow |x^2-2| = 2-x^2$

$\sqrt{(x-2)^2} = |x-2| = 2-x$.

$\cancel{x^2}+2+2-\cancel{x^2}+2-x$

$= \boxed{6-x}$

25. If $x = k$ is the solution of the equation $2x = 1 - \sqrt{2 - x}$, then $8k + 1 =$

(a) -1

(b) 9

(c) -7

(d) 1

(e) 7

See example 6 p. 122
and problems 29, 30 p. 126

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

Square

$4x^2 - 4x + 1 = 2 - x$

$4x^2 - 3x - 1 = 0$

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

$x = -\frac{1}{4} \qquad x = 1$

Check

$x = 1$ $\qquad 2(1) = 1 - \sqrt{2-(1)} = F$

$x = -\frac{1}{4}$ $\qquad 2(-\frac{1}{4}) = 1 - \sqrt{2 - (-\frac{1}{4})}$

$-\frac{1}{2} = 1 - \sqrt{\frac{9}{4}} = 1 - \frac{3}{2} = -\frac{1}{2}$

T

$\Rightarrow k = -1/4$

$8k + 1 = 8\left(-\frac{1}{4}\right) + 1 = -2 + 1 = \boxed{-1}$