

Name: Key

Perform the indicated operations:

1.) $2(3a^2 + a - 6) + (-a - a^2 + 1)$

2.) $(5a^3 - 4a^2 - a) - 3(a + 6 - 2a^2)$

3.) $\frac{3-2i}{9i}$

4.) $3i(2+i)(3-4i)$

4a) $\frac{4+3i}{2-\sqrt{-3}}$

4b) $2i^{84} - 2i^{107}$

Solve, any method and state multiplicity if necessary.

5.) $x^3 - 9x^2 + 20x = 0$

6.) $(x^2 + 9)^4(x^2 - 5) = 0$

7.) $3x^2(x + 12)^2(x - 5) = 0$

8.) $x^4 + 9x^2 + 20 = 0$

9.) $8x^3 - 125 = 0$

10.) $-3x^2 + 10 = 91$

11.) $(2x + 3)^2 = -12$

12.) $2x^2 - x = 3$

13.) $4x^2 = 25$

14.) $3x^2 - 8x = -2$

15.) $3x^3 - 2x^2 + 12x - 8 = 0$

16.) $3x^2 + 4x - 1 = 0$

Given:

16.) $x=4M3$ $x=7M1$

$x=-5M2$ $x=-1M1$

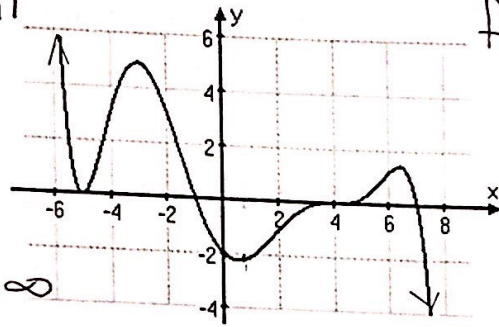
Roots & multiplicity if any:

Domain (interval notation)

$(-\infty, \infty)$
 Maximum: $5@-3$
 $1@6$

End behavior:

left $x \rightarrow -\infty$ $f(x) \rightarrow \infty$
 right $x \rightarrow \infty$ $f(x) \rightarrow -\infty$



$f(x) = (x+5)^2(x+1)(x-4)^3(x-7)$

write in terms of its linear factors:

Range (interval notation) $(-\infty, \infty)$

Increasing: $(-5, -3) \cup (1, 6.5)$

minimum:

$0@-5$
 $-2@1$

Sketch the graph the function and state all roots and multiplicity

17) $y = (x-3)^2(x+5)^3(x-1)$ 6th deg
 $x=3M2$
 $x=-5M3$
 $x=1M1$

19) $f(x) = x(x-2)^2(x+3)$ 4th deg
 $x=0M1$
 $x=2M2$
 $x=-3M1$

18) $y = -(x-7)(x+2)^2(x-1)^3(x+5)$ 7th deg
 $x=7$
 $x=-2M2$
 $x=1M3$
 $x=-5$

20.) $y = -x(x-3)^3(x+4)$ 5th deg
 $x=0$
 $x=3M3$
 $x=-4$

Divide use any method:

21.) $(3x^4 + 2x^3 - 8x - 48) \div (x^2 - 4)$

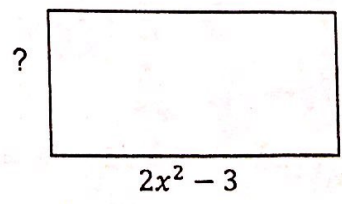
22.) $(24x^3 + 22x^2 + 2x + 1) \div (6x - 2)$

23.) $(3x^5 + 16x^4 - 9x^2 + 10x - 8) \div (x^2 + 5x - 1)$

24.) $(2x^5 - 3x^4 - 6x^3 - 12x^2 + 15x - 27) \div (x - 3)$

25.) $(3x^4 - 12x^2 - 6x) \div (x - 2)$

26) Perimeter is $26x^2 - 12x + 4$, find the length of the missing side?



Reviews

$$1) \cancel{6a^2} + \cancel{2a} - 12 - \cancel{a^2} - \cancel{a} + 1$$

$$5a^2 + a - 11$$

$$2) \cancel{5a^3} - \cancel{4a^2} - a - 3a - 18 + \cancel{6a^2}$$

$$5a^3 + 2a^2 - 4a - 18$$

$$3) \frac{3-2i}{9i} \begin{pmatrix} u \\ u \end{pmatrix} = \frac{3i-2i^2}{9i^2}$$

$$= \frac{2+3i}{-9}$$

$$4) 3i(2+i)(3-4i)$$

$$(6i+3i^2)(3-4i)$$

$$(-3+6i)(3-4i)$$

$$-9+12i+18i-24i^2$$

$$15+30i$$

$$4a) \frac{4+3i}{2-i\sqrt{3}} \begin{pmatrix} 2+i\sqrt{3} \\ 2+i\sqrt{3} \end{pmatrix}$$

$$\frac{8+4i\sqrt{3}+6i+3i^2\sqrt{3}}{4-i^2\sqrt{9}}$$

$$\frac{8+4i\sqrt{3}+6i-3\sqrt{3}}{7}$$

$$4b) 2(i^{84}) - 2i^{107}$$

$$2(1) - 2(-i)$$

$$2+2i$$

$$5) k(k^2-9k+20)=0$$

$$k(k-5)(k-4)=0$$

$$k=0 \quad k=5 \quad k=4$$

$$6) (k^2+9)(k^2-5)=0$$

$$k^2+9=0 \quad k^2=5$$

$$k^2=-9 \quad k=\pm\sqrt{5}$$

$$k=\pm 3i \text{ and } 4$$

$$7) 3x^2=0 \quad (x+12)=0 \quad x-5=0$$

$$x=0 \text{ and } 2 \quad x=-12 \text{ and } 2 \quad x=5$$

$$8) (x^2+4)(x^2+5)=0$$

$$x^2=-4 \quad x^2=-5$$

$$x=\pm 2i \quad x=\pm i\sqrt{5}$$

$$9) (2x-5)(4x^2+10x+25)=0$$

$$x = \frac{5}{2} \quad x = \frac{-10 \pm \sqrt{100-4(4)(25)}}{8}$$

$$= \frac{-10 \pm \sqrt{-300}}{8} = \frac{-10 \pm 10i\sqrt{3}}{8}$$

$$\frac{-5 \pm 5i\sqrt{3}}{4}$$

$$10) 0 \neq 0 \quad -3x^2=81$$

$$x^2=-27$$

$$x=\pm 3i\sqrt{3}$$

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

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

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

$$12) 2x^2-x-3=0$$

$$(x+1)(2x-3)=0$$

$$x=-1 \quad x=3/2$$

$$13) x^2 = \frac{25}{4}$$

$$x = \pm \frac{5}{2}$$

$$14) 3x^2 - 8x - 2 = 0$$

$$x = \frac{8 \pm \sqrt{64 - 4(3)(-2)}}{6}$$

$$= \frac{8 \pm \sqrt{88}}{6} = \frac{8 \pm 2i\sqrt{22}}{6}$$

$$= \frac{4 \pm i\sqrt{22}}{3}$$

$$16) x = \frac{-4 \pm \sqrt{16 - 4(3)(-1)}}{6}$$

$$= \frac{-4 \pm \sqrt{28}}{6}$$

$$= \frac{-4 \pm 2\sqrt{7}}{6}$$

$$= \frac{-2 \pm \sqrt{7}}{3}$$

$$15) x^2(3x-2) + 4(3x-2) = 0$$

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

$$x = \pm 2i \quad x = \frac{2}{3}$$

$$21) x^2 - 4 \overline{) 3x^4 + 2x^3 - 8x - 48}$$

$$\underline{3x^2 + 2x + 12}$$

$$x^2 - 4 \overline{) 3x^4 + 2x^3 + 0x^2 - 8x - 48}$$

$$\underline{- (\ominus 3x^4 \quad \oplus 12x^2)}$$

$$2x^3 + 12x^2 - 8x - 48$$

$$\underline{- (\ominus 2x^3 \quad \oplus 24x^2 \quad \ominus 8x)}$$

$$12x^2 - 48$$

$$\underline{- (\ominus 12x^2 \quad \oplus 48)}$$

$$0$$

23.)

$$3x^3 + x^2 - 2x + 2 \overline{) x^2 + 5x - 1}$$

$$\underline{- (\ominus 3x^3 \quad \oplus 15x^2 \quad \ominus 3x^3)}$$

$$x^4 + 3x^3 - 9x^2 + 10x$$

$$\underline{- (\ominus x^4 \quad \oplus x^3 \quad \ominus x^2)}$$

$$-2x^3 - 8x^2 + 10x - 8$$

$$\underline{- (\oplus 2x^3 \quad \oplus 10x^2 \quad \oplus 2x)}$$

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

$$\underline{- (\ominus 2x^2 \quad \oplus 10x \quad \oplus 2)}$$

$$-2x - 6$$

$$22.) 6x-2 \overline{) 24x^3 + 22x^2 + 2x + 1}$$

$$\underline{- (\ominus 24x^3 \quad \oplus 8x^2)}$$

$$30x^2 + 2x + 1$$

$$\underline{- (\ominus 30x^2 \quad \oplus 10x)}$$

$$12x + 1$$

$$\underline{- (\ominus 12x \quad \oplus 4)}$$

$$\frac{5}{6x-2}$$

$$3x^3 + x^2 - 2x + 2 + \frac{-2x-6}{x^2+5x-1}$$

$$24) x-3=0$$

$$x=3 \overline{) 2 \quad -3 \quad -6 \quad -12 \quad 15 \quad -27}$$

$$\underline{6^+ \quad 9^+ \quad 9^+ \quad -9^+ \quad 18^+}$$

$$2 \quad 3 \quad 3 \quad -3 \quad 6 \quad -9$$

$$2x^4 + 3x^3 + 3x^2 - 3x + 6 - 9/x - 3$$

or $6x-2=0$

$$x = \frac{2}{6} = \frac{1}{3}$$

$$\left. \begin{array}{r} 24 \quad 22 \quad 2 \quad 1 \\ \quad \quad 8 \quad 10 \quad 4 \\ \hline 24 \quad 30 \quad 12 \quad 5 \end{array} \right\} \frac{5}{6}$$

$$\frac{24}{6} \quad \frac{30}{6} \quad \frac{12}{6} \quad \frac{5}{6}$$

$$4x^2 + 5x + 2 + \frac{5}{6x-2}$$

$$25.) x-2=0$$

$$x=2 \overline{) 3 \quad 0 \quad -12 \quad -6 \quad 0}$$

$$\underline{\downarrow 6 \quad 12 \quad 0 \quad -12}$$

$$3 \quad 6 \quad 0 \quad -6 \quad -12$$

$$3x^3 + 6x^2 - 6 - \frac{12}{x-2}$$