Math 127 – College Algebra — Test 1 Review Sheet
Answers are at the end of this sheet.

1. Factor each of the following expressions completely.

(a) $3x^2 - 9x$
(b) $2x^4 - 14x^3$
(c) $20a^3b^2 - 10a^3b$
(d) $24y^4 - 8y^2$
(e) $3a^2 - 3a - 6$
(f) $3xy + 3y + 2ax + 2a$
(g) $x^2 - ax - bx + ab$
(h) $x^2 - 7x + 12$
(i) $x^3 - 9x^2 + 20x$
(j) $15 - 2x - x^2$
(k) $y^2 - 5y - 6$
(l) $y^2 - 5y + 6$
(m) $x^2 + 14xa + 48a^2$
(n) $a^2 - 8a - 9$
(o) $2x^2 - x - 15$
(p) $3x^4 + 2x^3 - 5x^2$
(q) $4x^2 - 11xy - 3y^2$
(r) $10x^2 - 3xa - 18a^2$
(s) $4y^5 + 7y^4 - 2y^3$
(t) $600x^4 - 100x^2 - 200$
(u) $8x^6 + 26x^3y^2 + 15y^4$
(v) $\frac{1}{9}x^2 + x + 2$
(w) $x^3 + 2x^2 - 9x - 18$
(x) $16x^4 - 81y^4$
(y) $(x-3)^2 - 25$
(z) $x^2 - 10x + 25 - y^2$
(aa) $16a^2 + 40ab + 25b^2$
(bb) $x^2 - \frac{4}{9}$
(cc) $8 + 27t^3$
(dd) $64 - (x-3)^3$
(ee) $\frac{8}{27}a^6b^3 - 1$
(ff) $15x^4 - 90x^3 + 135x^2$
(gg) $x^3 + 4x^2 - 9x - 36$
(hh) $9x^3 + 18x^2 - 4x - 8$
(ii) $10r^2 + 1250$
(jj) $x^2 - 81$
(kk) $15x^2 + 13x - 6$
(ll) $50 - 2a^2$
(mm) $(y+3)^2 + 10(y+3) + 25$
(nn) $3x(6a+7) - 4(6a+7)$
(oo) $4x^3(3x^2-1)^3 - 8x(3x^2-1)^3$
(pp) $2x^2(x+2) + 13x(x+2) + 15(x+2)$
(qq) $2x^2(x+1) + 7x(x+1) + 6(x+1)$
(rr) $x^2(x-3) + 14x(x-3) + 49(x-3)$

2. Solve the given equation.

(a) $3x - 2 = 7x + 1$
(b) $2(7x-3) - 6x + 2 = 2(4-3x)$
(c) $\frac{1}{2}(2x-3) + \frac{1}{4}(3x+1) = \frac{7}{8}(x+1)$
(d) $3(2x-1) - 7x + 2 = x$
(e) $.03(x-4) - .2(2x-1) = 3.95$
(f) $2x(2x-3) - (3x-1)(x+2) = x^2 - 11x + 2$
(g) $3x^2 - x = 2$
(h) $6x^2 - 5x - 6 = 0$
(i) $(x+5)(x-3) = 0$
(j) $x(15x+2) = 24$
(k) $3x^3 + 5x^2 - 12x - 20 = 0$
(l) $\frac{2x-3}{6} - \frac{3x+1}{3} = \frac{23}{12}$
(m) $x^2 = 9$
(n) $3y^2 = 75$
(o) $(3x-1)^2 = 5$
(p) $(4p-1)^2 = 49$
(q) $(2x+5)^2 + 2 = 0$
(r) $(7w+1)(5w+1) = w+7$
(s) $w^2 + 4w + 1 = 0$
(t) $16x^2 + 16x = -4$
(u) $(x-3)(x-2) = 5$
(v) $h^2 + 18 = 3h$
(w) $(x-7)(x+2) = 12$
(x) $\frac{1}{10}x^2 - \frac{1}{20}x = \frac{1}{5}$
(y) $(2x-5)^2 = 9$
(z) $(3x-5)^2 = 20$
(aa) $4x^2 - 9 = 16$
(bb) $3x^2 + 25 = 0$
(cc) $7x^2 - 343 = 0$
(dd) $6x^2 + 11x - 10 = 0$
(ee) $14x^2 + 12x - 2 = 0$
(ff) $2x^2 - 3x + 5 = 0$
(gg) $(3x-1)(x+2) = 4$
(hh) $7x^2 - 11x = 5x^2 + 2x - 1$
(ii) $3x^2 - x\sqrt{5} = -4$

3. Solve by completing the square.

   (a) $x^2 - 4x = 0$
   (b) $x^2 + 12x = -11$
   (c) $a^2 + \frac{1}{2}a = 6$
   (d) $4a^2 = 8a + 12$
   (e) $x^2 + 6x + 12 = 0$
   (f) $x^2 - 8x = 9$
   (g) $4x(x + 2) = 8$
   (h) $3x^2 - 5x + 9 = 0$

4. Simplify the complex number.

   (a) $(2i + 1)(i - 3) - 4i(1 + i)$
   (b) $\left(\sqrt{-2} + 5\right)\left(\sqrt{-10} - \sqrt{-25}\right)$
   (c) $(3i + 1) - (2 - i)$
   (d) $\frac{2 - 3i}{1 + i} \cdot \frac{i^2 - 4i}{2i + 1}$
   (e) $\frac{3i - 1}{2 + i}$
   (f) $(4 - i)^4$
   (g) $\left(4\sqrt{-2}\right)^3$
   (h) $\sqrt{\frac{-8}{50}}$
   (i) i^4
   (j) i^{23}
   (k) i^{120}
   (l) i^{215}
   (m) i^{-9}

5. Solve $A = \frac{1}{2}bh$ for h.

6. Solve $x = \frac{2y - 3}{4}$ for y.

7. Solve $A = 2\ell h + 2hw + 2w\ell$ for w.

8. Solve $3x - xy = y - 5$ for y.

9. Solve $x = \frac{3y - 2}{4y - 1}$ for y.

10. Solve $a^2 + b^2 + c^2 = d^2$ for b.

11. Solve $V = \frac{1}{3}\pi r^2 h$ for r.

12. Let $x^2 - 2xy + y^2 = 16$.

    (a) Find x when $y = 0$.
    (b) Find y when $x = 0$.
    (c) Find y when $x = 1$.

13. What is 20% of 237?

14. The number 42 is 15% of what number?

15. What percent of \$231.20 is \$11.56?

16. Amanda bought a new winter coat. There is no sales tax on clothing. If the coat was 10% off, and she paid \$162 for it, what was the original price of the coat?

17. Jordan spent \$150 for a nice meal out with his future in-laws. If he spent \$150, including a 20% tip, what was the price of the meal without the tip?

18. The long side of a rectangle is three times the length of the short side. The perimeter of the rectangle is 80 inches. Find the dimensions.

19. Jim has twice as many quarters as he does dimes. If the value of the coins is \$9.00, how many of each type does he have?

20. The sum of two numbers is 3 and the sum of their squares is 89. What are the numbers?

21. Simplify each of the following.

    (a) $\frac{5}{5x + 10}$
    (b) $\frac{8}{2x - 4}$
    (c) $\frac{14x - 7}{2x - 1}$
    (d) $\frac{x^2 - 4x - 12}{x^2 + 5x + 6}$
    (e) $\frac{x - 5}{5 - x}$
    (f) $\frac{x + 7}{x^2 - 49}$
    (g) $\frac{x^2 - 8x + 16}{x^2 - 16}$
    (h) $\frac{ax - 2x + 4a - 8}{ay - 2y + 3a - 6}$
    (i) $\frac{x + 2}{x^2 - 2x - 8}$
    (j) $\frac{x - 3}{x^2 - 9x}$
    (k) $\frac{ax - ay + bx - by}{ax - ay - bx + by}$
    (l) $\frac{a^2 + 5a}{a^3 + 10a^2 + 25a}$
    (m) $\frac{x^2 - x - 6}{x - 3}$
    (n) $\frac{x^4 - 1}{x - 1}$
    (o) $\frac{x^3 - 8}{x - 2}$
    (p) $\frac{a + b}{4} \cdot \frac{8}{a + b}$
    (q) $\frac{9}{x - y} \div \frac{3}{x - y}$
    (r) $\frac{15x}{x + y} \cdot \frac{2x + 2y}{10}$
    (s) $\frac{x + y}{x - y} \div \frac{xy}{x^2 - xy}$
    (t) $\frac{5y}{x^2 + y^2} \cdot \frac{x^3 + xy^2}{10x}$
    (u) $\left(x^2 - 9\right) \cdot \frac{5}{5x + 15}$
    (v) $\frac{5}{x} + \frac{7}{x}$
    (w) $\frac{x}{x + y} - \frac{y}{x + y}$
    (x) $\frac{x}{3} - \frac{3}{x}$
    (y) $\frac{11}{x^2 - 121} - \frac{x}{x^2 - 121}$
    (z) $\frac{x + 8}{x - 3} - \frac{x + 7}{x - 3}$
    (aa) $\frac{1}{x + 1} + \frac{2}{x - 1}$
    (bb) $1 - \frac{x}{x + 3}$
    (cc) $\frac{x}{x + 2} - \frac{1}{x}$
    (dd) $\frac{x^3 + 4x}{x^2 + 10x + 25} \cdot \frac{x^2 + 7x + 10}{x^4 - 16}$
    (ee) $\frac{x + 5}{x^2 - x - 30} \div \frac{x + 6}{x^2 - 36}$
    (ff) $\frac{x^2 - 7x + 12}{x^2 - 9} \cdot \frac{x^2 + 3x}{x^3 - 4x^2}$
    (gg) $\frac{x^2 - x - 30}{2x^2 + 11x + 5} \div \frac{x^2 - 3x - 18}{4x^2 - 1}$
    (hh) $\frac{x^2 + 4x}{x^2 - 16} \div \frac{x^2 - 3x}{x^2 + 8x} \cdot \frac{x^2 - 4}{x^2 - 6x + 9}$

(ii) $\dfrac{-3}{y^2+4y-32}+\dfrac{4}{y^2-64}$

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

(kk) $\dfrac{x+3}{x+7}-\dfrac{32}{x^2+6x-7}$

(ll) $\dfrac{10}{x^2+x-6}-\dfrac{8}{x^2-4}$

(mm) $\dfrac{3}{x^2-9}-\dfrac{2}{x^2-2x-3}$

(nn) $\dfrac{x}{x^2+5x+6}-\dfrac{x-12}{x^2+x-6}$

(oo) $\dfrac{x}{4x-12}+\dfrac{1}{x}+\dfrac{3}{x^2-3x}$

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

(qq) $\dfrac{\dfrac{4x^8}{9}}{\dfrac{16x^4}{27}}$

(rr) $\dfrac{\dfrac{1}{2}+\dfrac{1}{4}}{\dfrac{1}{2}-\dfrac{1}{4}}$

(ss) $\dfrac{1+\dfrac{1}{x}}{1-\dfrac{1}{x}}$

(tt) $\dfrac{\dfrac{1}{ab}}{\dfrac{1}{a}+\dfrac{1}{b}}$

(uu) $\dfrac{\dfrac{1}{x^2+7x+12}}{\dfrac{1}{x^2+x-6}}$

(vv) $\dfrac{\dfrac{x+9}{x^2+6x+9}}{\dfrac{2}{x^2-9}}$

(ww) $\dfrac{1-\dfrac{1}{x-5}}{1-\dfrac{8}{x+2}}$

(xx) $\dfrac{\dfrac{y}{x}-1}{\dfrac{x}{y}+1}$

(yy) $\dfrac{1-\dfrac{4}{y^2}}{1-\dfrac{1}{y}-\dfrac{6}{y^2}}$

Math 127
Test 1 Review Sheet Answers

1. (a) $3x(x-3)$
(b) $2x^3(x-7)$
(c) $10a^3b(2b-1)$
(d) $8y^2(3y^2-1)$
(e) $3(a-2)(a+1)$
(f) $(x+1)(3y+2a)$
(g) $(x-a)(x-b)$
(h) $(x-3)(x-4)$
(i) $x(x-4)(x-5)$
(j) $(5+x)(3-x)$
(k) $(y-6)(y+1)$
(l) $(y-3)(y-2)$
(m) $(x+6a)(x+8a)$
(n) $(a-9)(a+1)$
(o) $(2x+5)(x-3)$
(p) $x^2(3x+5)(x-1)$
(q) $(4x+y)(x-3y)$
(r) $(5x+6a)(2x-3a)$
(s) $y^3(y+2)(4y-1)$
(t) $100(3x^2-2)(2x^2+1)$
(u) $(4x^3+3y^2)(2x^3+5y^2)$
(v) $\dfrac{1}{9}(x+3)(x+6)$
(w) $(x+2)(x-3)(x+3)$
(x) $(4x^2+9y^2)(2x+3y)(2x-3y)$
(y) $(x-8)(x+2)$
(z) $(x-5-y)(x-5+y)$
(aa) $(4a+5b)^2$
(bb) $\left(x+\dfrac{2}{3}\right)\left(x-\dfrac{2}{3}\right)$
(cc) $(2+3t)(4-6t+9t^2)$
(dd) $(7-x)(13-2x+x^2)$
(ee) $\left(\dfrac{2}{3}a^2b-1\right)\left(\dfrac{4}{9}a^4b^2+\dfrac{2}{3}a^2b+1\right)$
(ff) $15x^2(x-3)^2$
(gg) $(x+4)(x+3)(x-3)$
(hh) $(x+2)(3x+2)(3x-2)$
(ii) $10(r^2+125)$
(jj) $(x+9)(x-9)$
(kk) $(3x-1)(5x+6)$
(ll) $2(5-a)(5+a)$
(mm) $(y+8)^2$
(nn) $(3x-4)(6a+7)$
(oo) $4x(3x^2-1)^3(x^2-2)$
(pp) $(x+2)(2x+3)(x+5)$
(qq) $(x+1)(2x+3)(x+2)$
(rr) $(x-3)(x+7)^2$

2. (a) $x=-\dfrac{3}{4}$
(b) $x=\dfrac{6}{7}$
(c) $x=\dfrac{17}{7}$
(d) $x=-\dfrac{1}{2}$
(e) $x=-\dfrac{387}{37}$
(f) all real numbers
(g) $x=-\dfrac{2}{3}, x=1$
(h) $x=\dfrac{3}{2}, x=-\dfrac{2}{3}$
(i) $x=-5, x=3$
(j) $x=\dfrac{6}{5}, x=-\dfrac{4}{3}$
(k) $x=-\dfrac{5}{3}, x=2, x=-2$
(l) $x=-\dfrac{33}{8}$

(n) $x = 3$ or $x = -3$

(o) $y = 5$ or $x = -5$

(p) $x = \dfrac{1 \pm \sqrt{5}}{3}$

(q) $p = 2, -\dfrac{3}{2}$

(r) $x = \dfrac{-5 \pm i\sqrt{2}}{2}$

(s) $w = \dfrac{2}{7}, -\dfrac{3}{5}$

(t) $w = -2 \pm \sqrt{3}$

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

(v) $x = \dfrac{5 \pm \sqrt{21}}{2}$

(w) $h = \dfrac{3 \pm i\sqrt{7}}{2}$

(x) $x = \dfrac{5 \pm \sqrt{129}}{2}$

(y) $x = \dfrac{1 \pm \sqrt{33}}{4}$

(z) $x = 4$ or $x = 1$

(aa) $x = \dfrac{5 \pm 2\sqrt{5}}{3}$

(bb) $x = \pm\dfrac{5}{2}$

(cc) $x = \pm\dfrac{5}{\sqrt{3}}i$

(dd) $x = \pm 7$

(ee) $x = -\dfrac{5}{2}, \dfrac{2}{3}$

(ff) $x = \dfrac{1}{7}, -1$

(gg) $x = \dfrac{3 \pm i\sqrt{31}}{4}$

(hh) $x = \dfrac{-5 \pm \sqrt{97}}{6}$

(ii) $x = \dfrac{13 \pm \sqrt{161}}{4}$

3. (a)

$$x^2 - 4x + 4 = 0 + 4$$
$$(x-2)^2 = 4$$
$$x - 2 = 2 \text{ or } x - 2 = -2$$
$$x = 4 \text{ or } x = 0$$

(b)

$$x^2 + 6x + 36 = -11 + 36$$
$$(x+6)^2 = 25$$
$$x + 6 = 5 \text{ or } x + 6 = -5$$
$$x = -1 \text{ or } x = -11$$

(c)

$$a^2 + \frac{1}{2}a + \frac{1}{16} = 6 + \frac{1}{16}$$
$$\left(a + \frac{1}{4}\right)^2 = \frac{97}{16}$$
$$a + \frac{1}{4} = \pm\frac{\sqrt{97}}{4}$$
$$a = \frac{-1 \pm \sqrt{97}}{4}$$

(d)

$$a^2 = 2a + 3$$
$$a^2 - 2a + 1 = 3 + 1$$
$$(a-1)^2 = 4$$
$$a - 1 = 2 \text{ or } a - 1 = -2$$
$$a = 3 \text{ or } a = -1$$

(e)

$$x^2 + 6x + 9 = -12 + 9$$
$$(x+3)^2 = -3$$
$$x + 3 = \pm i\sqrt{3}$$
$$x = -3 \pm i\sqrt{3}$$

(f)

$$x^2 - 8x + 16 = 9 + 16$$
$$(x-4)^2 = 25$$
$$x - 4 = \pm 5$$
$$x = 4 \pm 5$$
$$x = 9 \text{ or } x = -1$$

(g)

$$4x^2 + 8x = 8$$
$$x^2 + 2x + 1 = 2 + 1$$
$$(x+1)^2 = 3$$
$$x = -1 \pm \sqrt{3}$$

(h)

$$x^2 - \frac{5}{3}x + \frac{25}{36} = -3 + \frac{25}{36}$$
$$\left(x - \frac{5}{6}\right)^2 = -\frac{83}{36}$$
$$x = \frac{5}{6} \pm i\frac{\sqrt{83}}{6}$$

4. (a) $-1 - 9i$

(b) $(-2\sqrt{5} + 5\sqrt{2}) + i(5\sqrt{10} - 25)$

(c) $-1 + 4i$

(d) $\dfrac{-1 + 47i}{10}$

(e) $\dfrac{1 + 7i}{5}$

(f) $161 - 240i$

(g) $-128i\sqrt{2}$

(h) $\dfrac{2}{5}i$

(i) 1

(j) $-i$

(k) 1

(l) $-i$

(m) $-i$

5. $h = \dfrac{2A}{b}$

6. $y = 2x + \dfrac{3}{2}$

7. $w = \dfrac{A - 2\ell h}{2h + 2\ell}$

8. $y = \dfrac{3x + 5}{x + 1}$

9. $y = \dfrac{x - 2}{4x - 3}$

10. $b = \pm\sqrt{d^2 - a^2 - c^2}$

11. $r = \pm\sqrt{\dfrac{3V}{\pi h}}$

12. (a) $x = 4$, $x = -4$
    (b) $y = 4$, $y = -4$
    (c) $y = 5$, $y = -3$

13. 47.4

14. 280

15. 5%

16. The coat was \$180 originally.

17. The meal was \$125 without the tip.

18. 10 inches by 30 inches

19. 15 dimes and 30 quarters

20. The numbers are 8 and -5.

21. (a) $\dfrac{1}{x+2}$
    (b) $\dfrac{4}{x-2}$
    (c) 7
    (d) $\dfrac{x-6}{x+3}$
    (e) -1
    (f) $\dfrac{1}{x-7}$
    (g) $\dfrac{x-4}{x+4}$
    (h) $\dfrac{x+4}{y+3}$
    (i) $\dfrac{1}{x-4}$
    (j) $\dfrac{x-3}{x(x-9)}$
    (k) $\dfrac{a+b}{a-b}$
    (l) $\dfrac{1}{a+5}$
    (m) $x + 2$
    (n) $(x^2+1)(x+1)$
    (o) $x^2 + 2x + 4$
    (p) 2
    (q) 3
    (r) $3x$
    (s) $\dfrac{x+y}{y}$
    (t) $\dfrac{y}{2}$
    (u) $x - 3$
    (v) $\dfrac{12}{x}$
    (w) $\dfrac{x-y}{x+y}$
    (x) $\dfrac{x^2-9}{3x}$
    (y) $\dfrac{-1}{x+11}$
    (z) $\dfrac{1}{x-3}$
    (aa) $\dfrac{3x+1}{(x+1)(x-1)}$
    (bb) $\dfrac{3}{x+3}$
    (cc) $\dfrac{(x-2)(x+1)}{x(x+2)}$
    (dd) $\dfrac{x}{(x+5)(x-2)}$
    (ee) 1
    (ff) $\dfrac{1}{x}$
    (gg) $\dfrac{2x-1}{x+3}$
    (hh) $\dfrac{x(x+8)(x+2)(x-2)}{(x-4)(x-3)^3}$
    (ii) $\dfrac{1}{(y-4)(y-8)}$
    (jj) $\dfrac{(x+2)(x-1)}{x(x+1)}$
    (kk) $\dfrac{x-5}{x-1}$
    (ll) $\dfrac{2}{(x+3)(x+2)}$
    (mm) $\dfrac{1}{(x+3)(x+1)}$
    (nn) $\dfrac{8}{(x+2)(x-2)}$
    (oo) $\dfrac{x+4}{4(x-3)}$
    (pp) $\dfrac{x}{x-3}$
    (qq) $\dfrac{3x^4}{4}$
    (rr) 3
    (ss) $\dfrac{x+1}{x-1}$
    (tt) $\dfrac{1}{b+a}$
    (uu) $\dfrac{x-2}{x+4}$
    (vv) $\dfrac{(x+9)(x-3)}{2(x+3)}$
    (ww) $\dfrac{x+2}{x-5}$
    (xx) $\dfrac{y(y-x)}{x(x+y)}$
    (yy) $\dfrac{y-2}{y-3}$