Special Topics

Laws of Exponent

$$x^0 = 1 \qquad \frac{1}{x^n} = x^{-n}$$
$$x^n = \frac{1}{x^{-n}} \qquad \sqrt[n]{x} = x^{\frac{1}{n}}$$
$$x^m \cdot x^n = x^{m+n} \qquad \frac{x^m}{x^n} = x^{m-n}$$
$$(x^m)^n = x^{m \times n} \qquad (xy)^n = x^n \cdot y^n$$

1. Simplify:

(a) $\dfrac{a^3 \cdot b^2 \cdot (a^{-2})^{\frac{3}{2}}}{b^{-3} \cdot a^{-1}}$

(b) $\dfrac{(a^{-1}b^3)^2}{(ab)^2} \cdot \dfrac{a^2(a^5b^{-2})^3}{a(ab^3)^{-1}b^2}$

(c) $\dfrac{(a^2b^2)^{-1}b^3}{(a^2b^{-2})^{-3}(b^2)^2}$

(d) $\dfrac{(x^5y^3)^{-2}}{x^3(yxy^{-1})^2y} \cdot \dfrac{(yx^{-1})^2x^2}{x^5y^{-1}(x^2y)^2}$

(e) $\dfrac{(a^{-2})^4}{(a^7b^{-2})^{-3}} \cdot \dfrac{(b^3c^2)^{-3}}{ab(b^{-3})^3}$

(f) $\dfrac{(\sqrt{x})^4 \cdot y^3}{(x^{-5}y^2)^{-3}}$

(g) $\dfrac{\sqrt[3]{x^4} \cdot \sqrt{y^{-2}}}{x \cdot y^{-1}}$

(h) $\dfrac{(a^2b^3)^{-\frac{1}{6}}\sqrt[3]{a^2}}{\sqrt[4]{b^{-2}}}$

(i) $\dfrac{a^{\frac{3}{2}}b^{\frac{2}{3}}}{a^{\frac{2}{3}}b^{\frac{3}{2}}}$

(j) $\dfrac{\sqrt[10]{a^{100}} \cdot \sqrt[100]{b^{10}}}{a\left(a^{-3}b^{\frac{-1}{30}}\right)^{-3}}$

2. Find the x-intercept, y-intercept and *slope* of the following straight lines:

(a) $3x + 4y = 12$

(b) $2x + 14y = 10$

(c) $2x - y = 0$

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

(e) $\frac{x}{3} + \frac{y}{5} = 1$

(f) $\frac{x}{\frac{1}{3}} - y - 6 = 0$

(g) $x + 2 = 0$

(h) $y + a = 0$

(i) $x = 0$

(j) $y = 0$

3. Solve for x or t:

$$(a)\ \frac{x}{2} = 2 \quad (b)\ x + 2 = 10$$
$$(c)\ 3x = 5 \quad (d)\ 2t + 3 = t + 5$$
$$(e)\ \frac{t}{2} + \frac{3}{4} = t - 1 \quad (f)\ \frac{x-2}{3} = \frac{2x-4}{7}$$
$$(g)\ \frac{x-4}{2} + \frac{5}{2} = \frac{x-5}{4} - \frac{1}{2} \quad (h)\ \frac{1-t}{5} = \frac{2t}{3}$$
$$(i)\ \frac{1}{t-1} = \frac{2}{2-t} \quad (j)\ \frac{t+2}{t-10} = \frac{2}{5}$$

Answers: $(1.a)\ \frac{b^5}{a}$, $(1.b)\ \frac{a^{13}}{b}$, $(1.c)\ \frac{a^4}{b^9}$, $(1.d)\ \frac{1}{x^{24}y^6}$, $(1.e)\ \frac{1}{a^{28}b^7c^6}$, $(1.f)\ \frac{y^9}{x^{13}}$,

$(1.g)\ \sqrt[3]{x}$, $(1.h)\ \sqrt[3]{a}$, $(1.i)\ \sqrt[5]{\left(\frac{a}{b}\right)^6}$, $(1.j)\ 1$.

$(2.a)\ 4, 3, -\frac{3}{4}$; $(2.b)\ 5, \frac{5}{7}, -\frac{1}{7}$; $(2.c)\ 0, 0,$ undefined; $(2.d)\ -2, \frac{2}{3}, \frac{1}{3}$; $(2.e)\ 3, 5, -\frac{5}{3}$; $(2.f)\ 2, -6, 3$;
$(2.g)\ -2,$ doesn't exists, undefined (it's a vertical straight line);
$(2.h)$ doesn't exists, $-a, 0$ (it's a horizontal straight line);
$(2.i)\ 0,$ doesn't exists, undefined, it is the y-axis; $(2.j)$ doesn't exists, $0, 0$ (it is the x-axis)

$(3.a)\ 8$, $(3.b)\ 8$, $(3.c)\ \frac{5}{3}$, $(3.d)\ 2$, $(3.e)\ \frac{7}{2}$, $(3.f)\ 2$, $(3.g)\ -9$, $(3.h)\ \frac{3}{13}$, $(3.i)\ 0$,
$(3.j)\ -10$