Series: Mathematics - from zero to engineer (27).

Rearranging formulae.

Rearrange the formula to make ‚r' the dependent variable.

$$d = 2\sqrt{h(2r-h)} \quad /:2$$

$$\frac{d}{2} = \sqrt{h(2r-h)} \quad /^2$$

$$\frac{d^2}{4} = h(2r-h) \quad /\cdot\frac{1}{h}$$

$$\frac{d^2}{4h} = 2r-h$$

$$\frac{d^2}{4h} + h = 2r \quad /\cdot\frac{1}{2}$$

$$r = \frac{1}{2}\left(\frac{d^2}{4h} + h\right)$$

Make ‚R' the dependent variable.

$$V = \frac{\pi h(3R^2+h^2)}{6} \quad /\cdot 6$$

$$6V = \pi h(3R^2+h^2) \quad /:\pi h$$

$$\frac{6V}{\pi h} = 3R^2 + h^2$$

$$\frac{6V}{\pi h} - h^2 = 3R^2 \quad /\cdot\frac{1}{3}$$

$$\frac{2V}{\pi h} - \frac{1}{3}h^2 = R^2 \quad /\sqrt{\ }$$

$$R = \sqrt{\frac{2V}{\pi h} - \frac{1}{3}h^2}$$

Rearrange the formula to make ‚J' the dependent variable.

$$n = \frac{JR}{E - Jr} \quad /\cdot(E-Jr)$$

$$n(E-Jr) = JR$$

$$nE - nJr = JR$$

$$nE = JR + nJr$$

$$nE = J(R+nr) \quad /:(R+nr)$$

$$J = \frac{nE}{R+nr}$$

Make ‚f' the dependent variable.

$$\frac{R}{r} = \sqrt{\frac{f+P}{f-P}} \quad /^2$$

$$\frac{R^2}{r^2} = \frac{f+P}{f-P}$$

$$R^2(f-P) = r^2(f+P)$$

$$fR^2 - PR^2 = fr^2 + Pr^2$$

$$fR^2 - fr^2 = PR^2 + Pr^2$$

$$f(R^2-r^2) = PR^2 + Pr^2 \quad /:(R^2-r^2)$$

$$f = \frac{P(R^2+r^2)}{R^2-r^2}$$

If $f(x)=4x^3-\frac{6}{2x}$, then:

a) $f(3)=4\cdot 3^3-\frac{6}{2\cdot 3}=4\cdot 27-1=107$

b) $f(-4)=4\cdot(-4)^3-\frac{6}{2\cdot(-4)}=4\cdot(-64)+\frac{6}{8}=-256+\frac{3}{4}=-255\frac{1}{4}=-255,25$

c) $f\left(\frac{2}{5}\right)=4\cdot\left(\frac{2}{5}\right)^3-\frac{6}{2\cdot\frac{2}{5}}=4\cdot\frac{8}{125}-\frac{6}{\frac{4}{5}}=\frac{32}{125}-\frac{\cancel{6}^{3}}{1}\cdot\frac{5}{\cancel{4}_{2}}=\frac{32}{125}-\frac{15}{2}=$

$=\frac{64}{250}-\frac{1875}{250}=-\frac{1811}{250}=-7\frac{61}{250}=-7,244$

d) $f(-3,24)=4\cdot(-3,24)^3-\frac{\cancel{6}^{3}}{\cancel{2}_{1}\cdot(-3,24)}=-136,0489+0,926=$

$=-135,12$

correct to five significant figures

Review exercises.

Evaluate each of the following expressions, correct to three significant figures.

a) $y=\frac{nE}{R+nr}$ $\quad n=4,\ E=1,08,\ R=5,\ r=0,04$

$y=\frac{4\cdot 1,08}{5+4\cdot 0,04}=\frac{4,32}{5+0,16}=\frac{4,32}{5,16}=0,837$

b) $A=P\left(1+\frac{r}{100}\right)^n$ $\quad P=285,79,\ r=5,25,\ n=12$

$A=285,79\left(1+\frac{5,25}{100}\right)^{12}=285,79\left(1+0,0525\right)^{12}=$

$=285,79\cdot 1,0525^{12}=285,79\cdot 1,848=528.$

c) $P=A\frac{(nv/u)^{\frac{3}{2}}}{1+(nv/u)^3}$ $\quad A=40,\ u=30,\ n=2,5,\ v=42,75$

$P=40\cdot\frac{(2,5\cdot 42,75:30)^{\frac{3}{2}}}{1+(2,5\cdot 42,75:30)^3}=40\cdot\frac{3,5625^{\frac{3}{2}}}{1+3,5625^3}=40\cdot\frac{6,724}{1+45,213}=$

$=\frac{268,96}{46,213}=5,82$

Rearrange the formula to make ‚m' the dependent variable.

$$f = \frac{S(m-m)}{m+m} \quad /\cdot(m+m)$$

$$f(m+m) = S(m-m)$$

$$fm + fm = Sm - Sm$$

$$fm + Sm = Sm - fm$$

$$m(f+S) = m(S-f) \quad /:(f+S)$$

$$m = \frac{m(S-f)}{f+S}$$

Given that $f(x) = 3x^2 - 4x$, find $f(2)$ and $f(-3)$.

$$f(2) = 3\cdot 2^2 - 4\cdot 2 = 12 - 8 = 4$$

$$f(-3) = 3\cdot(-3)^2 - 4\cdot(-3) = 27 + 12 = 39$$