Garibsulton Davlatbekova (1)

1. Elementary algebra

P1.1 Simplify $\frac{x^{n+2}}{x^{n-2}} : \frac{x^{n-2+4}}{x^{n-2}} = x^4$

P1.2 $x^{-1} \cdot 8 = 2$
$x^{-1} \cdot 2^3 = 2$
$x^{-1} = \frac{2}{2^3} = \frac{1}{4}$
$x = 4$

P1.3 Calculate the missing value. If $a = 5$ & $b = 10$ then $(a^b)^0 =$
$= (5^{10})^0 = 1$

P1.4 Calculate $\frac{\sqrt{4x}}{\sqrt{x}} : \frac{2\sqrt{x}}{\sqrt{x}} = 2$

P1.5 $x^2 + (x+1)^2 = (x+2)^2$
$x^2 + x^2 + 2x + 1 = x^2 + 4x + 4$
$x^2 - 2x - 3 = 0$
$(x+1)(x-3) = 0$
$x_1 = -1$
$x_2 = 3$

P1.6 Sol. for inequality: $2^x > 1024$
$2^x > 2^{10}$
$x > 10$

2. Functions of one variable

P2.1 Relationship between temps measured in Cels & F. is linear.

Celsius: $0°C \xrightarrow{+100} 100°C$

Fahrenheit: $32°F \xrightarrow{+180} 212°C$

$y = 32 + 1{,}8x$
$32 + 1{,}8x = x$
$32 = -0{,}8x$
$x = -40$

P2.2 $f(x) = 5x + 4$
$y = ?$ if $f(3) = y$
$f(3) = 5 \cdot 3 + 4 = 19$

P2.3 $x^2 - 4x + 3 = 0$
$(x-1) \cdot (x-3) = 0$
$x_1 = 1$

P2.4 Invest 10 HUF for 90 days
$i = 2\%$
How much money do you receive 90yrs later?

$10 \cdot 1{,}02^{90} = 59{,}43$

or $10 \cdot e^{90 \cdot 0{,}02} = 60{,}49$

D. . $\ln 5$

3. Calculus → sum

P3,1 $\sum_{i=1}^{\infty} \frac{12}{6^i}$ →

$a_n = 12 \times \frac{1}{6^i}$

$a_1 = 12 \quad b = \frac{1}{6}$

$\sum_{i=1}^{\infty} \frac{12}{6^i} = \frac{12 \times \frac{1}{6}}{1 - \frac{1}{6}} = \frac{\frac{2}{6}}{\frac{5}{6}} = \frac{6 \times 2}{5} = \frac{12}{5}$

(2) Garibsulton Davl

P3,2 → limit $\lim_{x \to 1} \frac{6^{1-x}}{x} = \frac{6^{1-x} \times 6^x}{x \times 6^x} =$

$= \frac{6}{x \times 6^x} = \frac{6}{1 \times 6^1} = 1$

$x \to 1$

P3,3 → slope $f(x) = x^5 - 8$ at $x = -3$

$f'(x) = 5x^4$

$f(-3) = 5(-3)^4 = 81 \times 5 = 405$

P3,4 → deriv $\frac{d}{dx} \frac{x^3 + 2x - 1}{x - 2} =$

$= \frac{(3x^2 + 2)(x-2) - (x^3 + 2x - 1) \times 1}{(x-2)^2} =$

$= \frac{3x^2 - 6x^2 - 2x - 4 - x^3 - 2x + 1}{x^2 - 4x + 4} =$

$= \frac{2x^3 - 6x^2 - 3}{x^2 - 4x + 4}$

P3,5 → sec deriv $\frac{d^2}{dx^2} 4x^4 + 4x^2 =$

$d_1 = 16x^3 + 8x$

$d_2 = 48x^2 + 8$

P3,6 → 3 der $\frac{d}{dx} \frac{\ln x}{e^x} = \frac{\frac{1}{x} \times e^x - \ln x \cdot e^x}{(e^x)^2} =$

$= \frac{\frac{1}{x} - \ln x}{e^x}$

P3,7 $f(x) = 3x^2 - 5x + 2 \rightarrow d_1 = 6x - 5$

$d_2 = 6 \quad 6x - 5 = 0$

$6x = 5$

$x = \frac{5}{6}$

stationary point $= \frac{5}{6}$

$d_2 = 6$ – local min

	$-\infty$	$5/6$	$5/6$	$+\infty$
$f(x)$	↑	local min	↗	
$f'(x)$	−	0	+	
$f''(x)$	+	+	+	

P3,8 $f(x,y) = x^2 + y^3$.

$f(2,3)$?

$f(x,y) = x^2 + y^3$

$f(2,3) = 2^3 + 3^3 = 4 + 27 = 31$

P3,9 $f(x,y) = \ln(x - y)$

for what comb. x & y is defined?

$f(x,y) = \ln(x-y) \; y(x-y) > 0$

$y > 4$

P3,10 deriv → $\frac{\partial}{\partial x} x^5 + xy^3 = 5x^4 + y^3$

P3,11 → local max or min $f(x,y) = x^2 y^2 + 10$

$f'x = 2xy^2 \quad f'y = x^2 2y$

$f''x = 2y^2 \quad f''y = x^2 \times 2$

local min for

P 3,12 $\max x^2y^2$

$x+y=10$

$\left.\begin{matrix} 2xy^2-N=0 \\ 2yx^2-N=0 \end{matrix}\right\} 2xy^2=2yx^2$

$x=y$

$\left.\begin{matrix} x+y-10=0 \\ x=y \end{matrix}\right\} x+y=10$

$x=y=5$

4. Linear algebra

Pr 4.1

$$A=\begin{bmatrix}2&6\\5&1\\1&9\end{bmatrix} \qquad B=\begin{bmatrix}1&1&7\\2&8&2\end{bmatrix}$$

$$A\times B=\begin{bmatrix}2\times1+ & 1\times2+ & 7\times2+\\ 6\times2 & 8\times6 & 6\times2\\ 5\times1+ & 1\times5+ & 7\times5+\\ 2\times1 & 8\times1 & 1\times2\\ 1\times1+9\times2 & 1\times1+ & 7\times1+\\ & 8\times9 & 2\times9\end{bmatrix}=\begin{bmatrix}14&50&26\\7&13&37\\19&73&25\end{bmatrix}$$

Pr 4.2

$$A=\begin{bmatrix}2&2\\4&6\\1&3\end{bmatrix} \qquad B=\begin{bmatrix}1&9&1\\2&1&2\end{bmatrix}$$

$$B\times A=\begin{bmatrix}1\times2+ & 1\times2+\\ 9\times4+ & 9\times6+\\ 1\times1 & 1\times3\\ 2\times2+ & 2\times2+\\ 1\times4+ & 1\times6+\\ +2\times1 & 2\times3\end{bmatrix} \qquad BA=\begin{bmatrix}39&59\\10&16\end{bmatrix}$$

Pr 4.3 Transpose

$$\begin{bmatrix}7,1&8,1&4,7\\2&7,8&1,1\\4&4,44&0\end{bmatrix}^T=\begin{bmatrix}7,1&2&4\\8,1&7,8&4,44\\4,7&1,1&0\end{bmatrix}$$

Pr 4.4 → determinant

$$\begin{bmatrix}1&8\\2&8\end{bmatrix}=1\times8-8\times2=-10$$

5. Probability theory

Pr 5.1

d_1	1	2	3	4	5	6
d_2	11	21	31	41	51	61

Pr. 5.2 Drug test

	+	−

Pr 5,3 Drug test ④ Garibsulton Davlatbekova

We can take data from 5,2 pr.

	+	−	=	
Drug user	1×99%	1×1%	0,99%	0,01%
Not a drug user	99×5%	99×99,5%	0,495%	98,50%

$$\frac{0,99\%}{0,99\% + 0,495\%} = \frac{1}{3} = 66,7\%$$