ILDA
KACERJA

Problem 1.1

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

Problem 1.2

$$x^{-1} * 8 = 2$$

$$8 = 2x$$

$$\boxed{x = 4}$$

Problem 1.3

$$(a^b)^0 = 1$$

Problem 1.4

$$\frac{|4x|}{|x|} = \frac{|4|\,|x|}{|x|} = 2$$

Problem 1.5

$$x^2 + (x+1)^2 = (x+2)^2$$

$$x^2 + x^2 + 2x + 1 = x^2 + 4x + 4$$

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

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

$$\boxed{x_1 = 3} \qquad \boxed{x_2 = -1}$$

Problem 1.6

$$2^x > 1024$$

$$2^x > 2^{10}$$

$$x > 10$$

Problem 2.1

°C		°F
0	→	32
100	→	212

$+100 \left(\begin{matrix} 0 \\ 100 \end{matrix} \rightarrow \begin{matrix} 32 \\ 212 \end{matrix} \right) +180$

$$32 + 1.8X = X$$

$$32 = -0.8X$$

$$X = \frac{32}{-0.8} = -40$$

Problem 2.2

$$f(x) = 5x + 4$$

$$y = f(3) = 5 \cdot 3 + 4$$

$$\boxed{y = 19}$$

Problem 2.3

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

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

$$\boxed{x_1 = 3} \quad \boxed{x_2 = 1}$$

Problem 2.4

$$10 \cdot (1.02)^{30} = 59.4313$$

Problem 2.5

$$e^{\ln 5} = 5$$

Problem 3.1

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

Problem 3.2

$$\lim_{x \to 1} \frac{6^{1-x}}{x} = \lim_{x \to 1} \frac{6^{1-x} \cdot 6^x}{x \cdot 6^x} = \lim_{x \to 1} \frac{6}{1 \cdot 6} = 1$$

Problem 3.3

$$f(x) = x^5 - 8$$

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

$$f'(-3) = 5(-3)^4 = 405$$

Problem 3.4

$$\frac{d}{dx} \frac{x^3+2x-1}{x-2} = \frac{(3x^2+2)(x-2) - (x^3+2x-1)}{(x-2)^2} = \frac{3x^3 - 6x^2 + 2x - 4 - x^3 - 2x + 1}{(x-2)^2}$$

$$= \frac{2x^3 - 6x^2 - 3}{(x-2)^2}$$

Problem 3.5

$$\frac{d^2}{dx^2} 4x^4 + 4x^2 = \frac{d}{dx} 16x^3 + 8x = 48x^2 + 8$$

Problem 3.6

$$\frac{d}{dx} \frac{\ln x}{e^x} = \frac{\frac{1}{x} e^x - \ln x \cdot e^x}{(e^x)^2} = \frac{\frac{1}{x} - \ln x}{e^x}$$

Problem 3.7

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

$f'(x) = 6x - 5 \rightarrow x = \frac{5}{6}$ ↗ stationary point

$f''(x) = 6$

	$-\infty$		$\frac{5}{6}$		∞
$f(x)$	↘		local min		↗
$f'(x)$	−		0		+
$f''(x)$	+		+		+

Concave

Problem 3.8

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

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

Problem 3.9

$f(x) = \ln(x-y)$

$x - y > 0$

$x > y$ → for the function to be defined

Problem 3.10

$\frac{\partial}{\partial x} x^5 + xy^3 = 5x^4 + y^3$

Problem 3.11

$f(x,y) = x^2y^2 + 10$

$f'_x = 2xy^2$

$f'_y = 2x^2y$

$f''_x = 2y^2$

$f''_y = 2x^2$

$f''_{xy} = 4xy$

$2xy^2 = 0$

$2x^2y = 0$

$x = 0$ or $y = 0$

$(0, y)$ or $(x, 0)$

→ local min or max ←

Problem 3.12

$\mathcal{L} = x^2y^2 - \lambda(x + y - 10)$

$\frac{\partial \mathcal{L}}{\partial x} = 2xy^2 - \lambda = 0$

$\frac{\partial \mathcal{L}}{\partial y} = 2x^2y - \lambda = 0$

$\Rightarrow x = y$

$\frac{\partial \mathcal{L}}{\partial \lambda} = x + y - 10 = 0$

$2x - 10 = 0$

$x = 5$

$y = 5$

Problem 4.1

$$A \cdot B = \begin{bmatrix} 2 & 6 \\ 5 & 1 \\ 1 & 9 \end{bmatrix} \cdot \begin{bmatrix} 1 & 1 & 7 \\ 2 & 8 & 2 \end{bmatrix} = \begin{bmatrix} 14 & 50 & 26 \\ 7 & 13 & 37 \\ 19 & 73 & 25 \end{bmatrix}$$

Problem 4.2

$$B \cdot A = \begin{bmatrix} 1 & 9 & 1 \\ 2 & 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 2 & 2 \\ 4 & 6 \\ 1 & 3 \end{bmatrix} = \begin{bmatrix} 39 & 59 \\ 10 & 16 \end{bmatrix}$$

Problem 4.3

Transpose of the matrix is $\begin{bmatrix} 7.1 & 2 & 4 \\ 9.1 & 7.8 & 4.44 \\ 4.7 & 1.1 & 0 \end{bmatrix}$

Problem 4.4

$$\det \begin{bmatrix} 1 & 9 \\ 2 & 8 \end{bmatrix} = 8 - 18 = -10$$

Problem 5.1

dice 1 \ dice 2	1	2	3	4	5	6
1	11	12	13	14	15	16
2	21	22	23	24	25	26
3	31	32	33	34	35	36
4	41	42	43	44	45	46
5	51	52	53	54	55	56
6	61	62	63	64	65	66

} sample space

Problem 5.2

		drug test +	drug test −
Use drug	1%	99%	1%
Doesn't use drug	99%	0.5%	99.5%

$$99\% \cdot 1\% + 0{,}5\% \cdot 99\% = 1.485\%$$

douce

Problem 5.3

$$P(\text{drug user} \mid +) = \frac{P(\text{drug user} \cap +)}{P(+)} = \frac{P(+ \mid \text{drug user}) \cdot P(\text{drug user})}{P(+)} =$$

$$= \frac{99\% \cdot 1\%}{1.485\%} = 0.666 = 66.7\%$$