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GAUTENGSE DEPARTEMENT VAN ONDERWYS

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POSSIBLE ANSWERS FOR / MOONTLIKE ANTWOORDE VIR :

FUNCTIONAL MATHEMATICS SG PAPER 1
FUNKSIONELE WISKUNDE SG VRAESTEL 1
303-2/1

Vraestel 1: Paper 1:

Vraag 1/ Question 1:

$$1.1.1 \quad T_n = 3n - 5$$

$$\therefore T_1 = 3(1) - 5 \\ = -2 \quad (1)$$

$$T_2 = 3(2) - 5 \\ = 1 \quad (1)$$

$$T_3 = 3(3) - 5 \\ = 4 \quad (1)$$

$$1.1.2 \quad d = 3 \quad (1)$$

$$1.2.1 \quad T_n = a + (n-1)d \\ \therefore 50 = 5 + (n-1)3 \quad (1)$$

$$\therefore 50 = 5 + 3n - 3$$

$$\therefore -3n = 2 - 50$$

$$\therefore -3n = -48 \quad (1)$$

$$\therefore n = 16 \quad (1)$$

$$1.2.2 \quad S_n = \frac{n}{2} [2a + (n-1)d] \\ \therefore S_{16} = \frac{16}{2} [2(5) + (16-1)3] \quad (1) \\ = 8 [10 + 15(3)] \\ = 8 [10 + 45] \\ = 8 [55] \\ = 440 \quad (1)$$

$$1.3.1 \quad T_6 = 3 \\ \therefore a + 5d = 3 \quad (1)$$

$$\therefore a = 3 - 5d$$

$$\therefore 3 - 5d = 19 - 13d$$

$$\therefore 8d = 16$$

$$\underline{d = 2} \quad (1)$$

$$T_4 = 19 \\ a + 3d = 19 \quad (1)$$

$$a = 19 - 3d$$

(4)

$$1.3.2 \quad a = 3 - 5(2) \\ a = -7 \quad (1)$$

(1)

Vraag 2/ Question 2:

$$2.1 \quad T_n = ar^{n-1} \\ \therefore 512 = 2(2)^{n-1} \quad (1)$$

$$\therefore 256 = 2^{n-1} \quad (1)$$

$$\therefore 2^8 = 2^{n-1} \quad (1)$$

$$\therefore 8 = n - 1 \quad (3)$$

$$\therefore \underline{n = 9} \quad (1)$$

(b)

$$2.2.1 \quad \frac{T_2}{T_1} = \frac{T_3}{T_2} \quad (1)$$

$$\therefore \frac{3x-5}{x} = \frac{4x}{3x+5} \quad (1)$$

$$\therefore (3x-5)(3x+5) = 4x(x) \quad (1)$$

$$\therefore 9x^2 - 30x + 25 = 4x^2 \quad (1)$$

$$\therefore 5x^2 - 30x + 25 = 0 \quad (1)$$

$$\therefore x^2 - 6x + 5 = 0$$

$$\therefore (x-5)(x-1) = 0 \quad (1)$$

$$\therefore x = 5 \quad (1) \text{ of } x = 1 \quad (1)$$

(c)

$$2.2.2 \quad T_1 = 2(a) - 1 \text{ of } T_1 = x = 5 \\ = 5 \quad (1)$$

$$T_2 = 3(a) + 1 \\ = 10 \quad (1)$$

$$T_2 = 3x - 5 \\ = 3(5) - 5 \\ = 10$$

$$T_3 = 7(a) - 1 \\ = 20 \quad (1)$$

$$T_3 = 4x \\ = 4(5) \\ = 20 \quad (1)$$

(d)

$$2.2.3 \quad S_n = \frac{a(r^n - 1)}{r - 1} \quad (1) \\ = \frac{5(2^9 - 1)}{2 - 1} \\ = \frac{5(128 - 1)}{1} \\ = 5(127) \\ = 635 \quad (1)$$

(e)

Worked Example 3.1 Question 3:

$$\begin{aligned}
 3.1.2 \quad \log_x 125 &= 3 \\
 125 &= x^3 \quad (1) \\
 5^3 &= x^3 \quad (2) \\
 5 &= x \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 3.2.1 \quad 3^{2x} &= 37 \\
 2x &= \frac{\log 37}{\log 3} \quad (1) \\
 2x &= 3.286 \quad (2) \\
 x &= 1.64 \quad (3)
 \end{aligned}$$

3.3

$$\begin{aligned}
 3.3.1 \quad \frac{\log 9}{\log 27} &= \frac{\log 3^2}{\log 3^3} \quad (1) \\
 &= \frac{2 \log 3}{3 \log 3} \quad (2) \\
 &= \frac{2}{3} \quad (3)
 \end{aligned}$$

$$\begin{aligned}
 3.3.2 \quad \log 25 + \log 8 - \log 2 \\
 &= \log \left(\frac{25 \times 8}{2} \right) \quad (1) \\
 &= \log 100 \quad (2) \\
 &= 2 \log 10 \quad (3) \\
 &= 2 \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 &= \frac{2 \log 2^6}{\log 2^2} - \frac{\log 2^5}{\log 2^2} + \frac{\log 3}{\log 3} \\
 &= \frac{6 \log 2}{2 \log 2} - \frac{5 \log 2}{2 \log 2} - \frac{\log 3}{\log 3} \\
 (b) \quad &= \frac{6}{2} - \frac{5}{2} - 1 \quad (1) \\
 &= \frac{6 - 5 - 2}{2} \\
 &= -\frac{1}{2} \quad (2)
 \end{aligned}$$

3.4

$$\begin{aligned}
 3.4.1 \quad \log 600 \\
 &= \log (6 \times 100) \quad (1) \\
 &= \log 6 + \log 100 \quad (2) \\
 &= a + 2 \quad (3)
 \end{aligned}$$

Prog 4 / Question 4:

4.1

$$4.1.1 \quad \left(\frac{2}{3}\right)^3 = \frac{2^3}{3^3} \textcircled{1}$$

$$= \frac{8}{27} \textcircled{1} \quad (3)$$

$$4.1.2 \quad \sqrt{98} + \sqrt{18} - \sqrt{32}$$

$$= 7\sqrt{2} \textcircled{1} + 3\sqrt{2} \textcircled{1} - 4\sqrt{2} \textcircled{1}$$

$$= 10\sqrt{2} \textcircled{1} - 4\sqrt{2}$$

$$= 6\sqrt{2} \textcircled{1} \quad (5)$$

4.1.3

$$\frac{9^x \cdot 3^{2-x} \cdot 3^{x-1}}{3^{2x+1}}$$

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

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

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

$$= 3^{2x+1} \textcircled{1}$$

$$\frac{3^{2x+1}}{3^{2x+1}} \quad (5)$$

$$= 1 \textcircled{1}$$

4.1.4

$$\frac{3^{x+1} - 3^x}{6 \cdot 3^x} = \frac{3^x(3-1)}{6 \cdot 3^x} \textcircled{1}$$

$$= \frac{3^x(2)}{3^x \cdot 6} \textcircled{1}$$

$$(4) \quad = \frac{2}{6}$$

$$= \frac{1}{3} \textcircled{1}$$

4.2.1

$$2x-4 = 32^{x+1}$$

$$\textcircled{1} \quad (2^3)^{2x-4} = \textcircled{1} (2^5)^{x+1}$$

$$6x-12 = 5x+5$$

$$x \textcircled{1} = 17 \quad (5)$$

4.2.2

$$x = \sqrt[4]{81}$$

$$x = \sqrt[4]{3^4}$$

$$x = 3$$

$$x = 27 \quad (3)$$

Vraag 5 / Question 5:

51. $f(x) = 3x^2 - 2$

$$f(-4) = 3(-4)^2 - 2$$
$$= 46 \quad \textcircled{0}$$

$$f(2) = 3(2)^2 - 2$$
$$= 10 \quad \textcircled{0}$$

$$\text{gradient} = \frac{46 - 10}{-4 - 2} \quad \textcircled{0}$$
$$= \frac{-6}{-6} \quad \textcircled{0}$$

(5)

52. $f(x) = -x^2$

$$f(x+h) = -(x+h)^2$$
$$= -x^2 - 2xh - h^2$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{(-x^2 - 2xh - h^2) - (-x^2)}{h} \quad \textcircled{0}$$

$$= \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h} \quad \textcircled{0}$$

$$= \lim_{h \rightarrow 0} -2x - h \quad \textcircled{0}$$

$$= -2x - 0 \quad \textcircled{0}$$

$$= -2x \quad \textcircled{0}$$

(6)

53. 531. $g(x) = x \quad \textcircled{0}$
 $g'(x) = 1 \quad \textcircled{0}$

(1)

532. $g(x) = \frac{1}{3}x^3 - 5x^2$
 $g'(x) = x^2 - 10x \quad \textcircled{0}$

(3)

533. $g(x) = x^2(3x + 5x^3)$
 $= 3x^3 + 5x^5 \quad \textcircled{0}$

$g'(x) = 9x^2 + 25x^4 \quad \textcircled{0}$

(4)

54. $\lim_{x \rightarrow -4} (2x - 2) = 2(-4) - 2$
 $= -8 - 2$
 $= -10 \quad \textcircled{0}$

(2)

55. 55.1. $g(-1) = 2(-1)^2 - 3(-1) + 8$
 $= 13 \quad \textcircled{0}$

(1)

55.2. $g'(x) = 4x - 3 \quad \textcircled{0}$

(2)

$$\begin{aligned}
 5.53 \quad g'(-1) &= 4(-1) - 3 \\
 &= -4 - 3 \\
 &= \underline{-7} \quad \text{①}
 \end{aligned}$$

(1)

$$\begin{aligned}
 5.6.4 \quad y - 13 &= -7(x - (-1)) \quad \text{①} \\
 y - 13 &= -7x - 7 \\
 y &= -7x - 7 + 13 \\
 \underline{y} &= \underline{-7x + 6} \quad \text{②}
 \end{aligned}$$

(3)

Vraag 6 / Question 6:

$$\lambda = 0$$

$$6.2 \quad 0 = 2x^3 - 3x^2$$

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

$$\underline{x=0} \text{ of } 2x-3=0$$

A

$$2x = 3$$

$$\underline{x = 1.5} \text{ ①}$$

C (1.5; 0)

C

(4)

f(0)

$$y = 2(0)^3 - 3(0)^2$$

$$= 0$$

→

Drainpunte

6.1

$$f'(x) = 6x^2 - 6x$$

$$\underline{0 = 6x(x-1)}$$

$$6x=0 \text{ of } x-1=0$$

$$\underline{x=0} \text{ ①}$$

$$\underline{x=1} \text{ ①}$$

$$f(1) = 2(1)^3 - 3(1)^2$$

$$= 2 - 3$$

$$= -1 \text{ ①}$$

→
B

(3)

(2)

(2)

(7)

$$A = (0; 0)$$

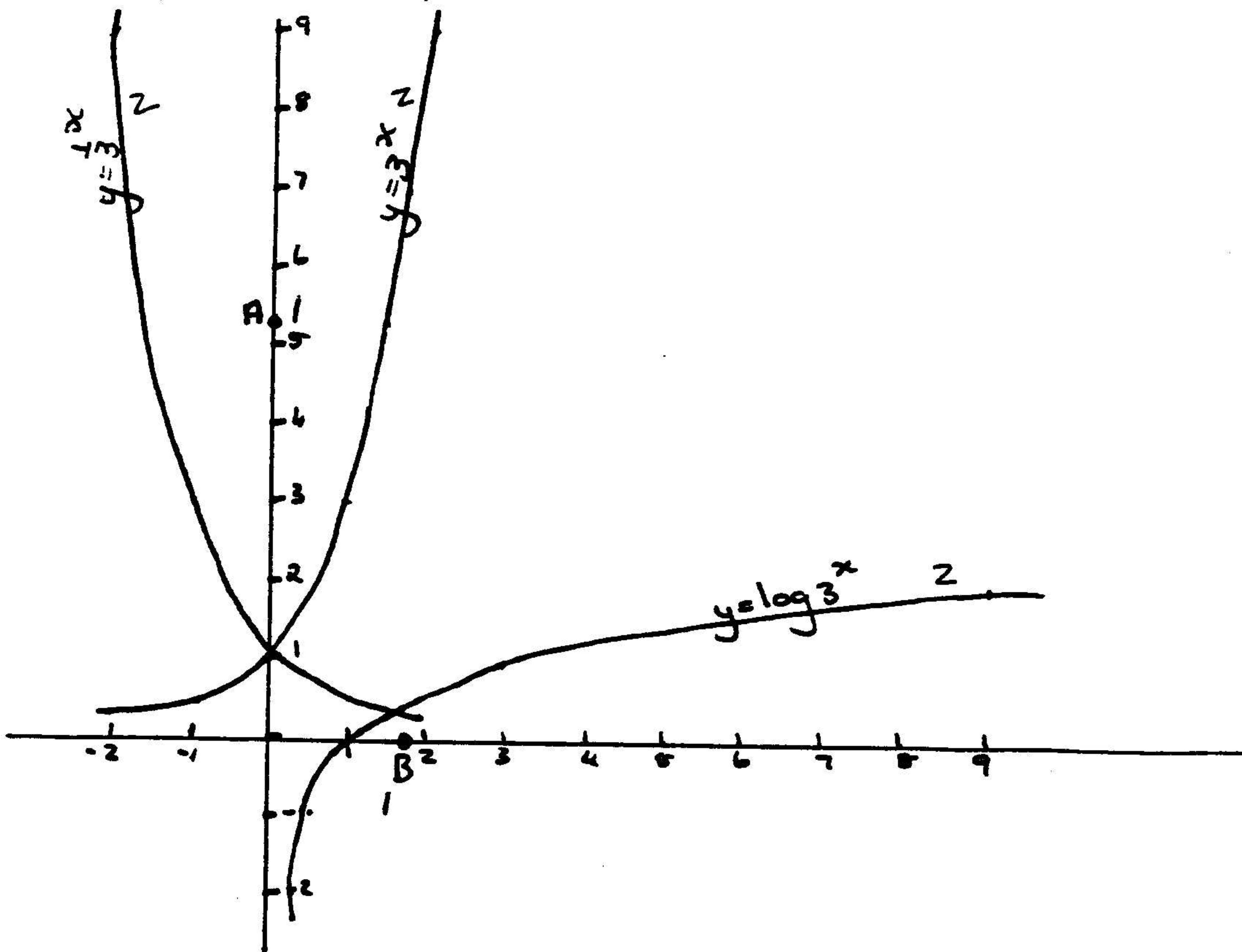
$$B = (1; -1)$$

Grafiken / Graphs

7.1

x	-2	-1	0	1	2
3^x	0,11	0,3	1	3	9
$\frac{1}{3}^x$	9	3	1	0,3	0,11

x	0,1	0,3	1	3	9
$\log_3 x$	-2	-1	0	1	2



(11)

7.2.1 $x = 1$

7.2.2 $A \rightarrow y = 5,1$ (1)

7.2.3 $B \rightarrow x = 1,8$ (1)

7.2.4.

$$3^x = 11$$

$$2,5^1 = 2,5$$

$$3^1 = 3$$

$$2,25^1 = 2,25$$

$$3^1 = 3$$

$$2,125^1 = 2,125$$

$$3^1 = 3$$

$$2,1875^1 = 2,1875$$

$$3^1 = 3$$

$$2,1^1 = 2,1$$

$$3^1 = 3$$

$$2,18^1 = 2,18$$

$$3^1 = 3$$

$$2,18^1 = 2,18$$

$$3^1 = 3$$

$$2,18^1 = 2,18$$

$$x = 2,18$$

(6)

$$\begin{array}{r} 9 \quad 15 \quad 27 \\ 2 \quad \quad 3 \\ \hline 2,7 \end{array}$$

$$\begin{array}{r} 9 \quad 11,8 \quad 15 \\ 1 \quad \quad 1 \\ 2 \quad 2,25 \quad 2,5 \\ \hline 2,25 \end{array}$$

$$\begin{array}{r} 9 \quad 10,3 \quad 11,8 \\ 1 \quad \quad 1 \\ 2 \quad 2,125 \quad 2,2 \\ \hline 2,125 \end{array}$$

$$\begin{array}{r} 10,3 \quad 11,05 \quad 11,8 \\ 1 \quad \quad 1 \\ 2 \quad 2,1875 \quad 2,25 \\ \hline 2,1875 \end{array}$$

[20]