(වැරදි හෝ අඩුපාඩු තිබිය හැක.)

# MI19 exam - MC

(ඇතැම් සුළු කිරීම් වෙනත් ආකාරවලින්ද සිදු කළ හැක)

(178)

$$\begin{array}{r} 11100011 \\ \times 101 \\ \hline 11100011 \\ 00000000\phantom{0} \\ 11100011\phantom{00} \\ \hline 10001101111 \\ \hline\hline \end{array}$$

$1 \times 1 = 1$ $\quad 1 + 1 = 10$

$0 \times 0 = 0$ $\quad 0 + 0 = 0$

$1 \times 0 = 0$ $\quad 0 + 1 = 1$

$0 \times 1 = 0$ $\quad 1 + 0 = 1$

---

$\bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$

$\bar{A}B\bar{C} + \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$ (Rewrite)

$\bar{A}\bar{C}(B + \bar{B}) + \bar{B}\bar{C}(A + \bar{A})$

$\bar{A}\bar{C} \cdot 1 + \bar{B}\bar{C} \cdot 1$

$\bar{A}\bar{C} + \bar{B}\bar{C}$

$\bar{C}(\bar{A} + \bar{B})$

---

$1061_8$

$$\begin{array}{cccc} 1 & 0 & 6 & 1 \\ 8^3 & 8^2 & 8^1 & 8^0 \\ (512) & (64) & (8) & (1) \end{array}$$

$$1061_8 = (512 \times 1) + (0 \times 64) + (6 \times 8) + (1 \times 1)$$

$$= 512 + 0 + 48 + 1$$

$$1061_8 = \underline{\underline{561_{10}}}$$

---

$A \rightarrow$

$$\begin{array}{r} 101010111 \\ +100010 \\ \hline 101111001 \end{array}$$

$$\begin{array}{r} 111111111 \\ 101111001 \\ \hline 010000110 \end{array} \leftarrow \text{1's complement}$$

$n = 9$ $\quad (r^n - 1) - N$

$r = 2$ $\quad (2^9 - 1) - 101010111$

$(1000000000 - 1) - 101010111$

$111111111 - 101010111$

$$\begin{array}{r} 010000110 \\ +1 \\ \hline 010000111 \\ \hline\hline \end{array} \leftarrow \text{2's complement}$$

$$\begin{array}{cccccccccc} 512 & 256 & 128 & 64 & 32 & 16 & 8 & 4 & 2 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ & & & & & & & & & -1 \\ \hline & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \end{array}$$

$ABC + \bar{A}B + AB\bar{C}$

$ABC + AB\bar{C} + \bar{A}B$ (Rewrite) (Associative law)

$AB(C+\bar{C}) + \bar{A}B$ (distributive law)

$AB \cdot 1 + \bar{A}B$ (inverse law)

$AB + \bar{A}B$ (indentity law)

$BA + B\bar{A}$ (Commutative law)

$B \cdot (A+\bar{A})$ (distributive law)

$B \cdot 1$ (inverse law)

$B$ (Identity law)

---

$273.25_{10} \longrightarrow$ binary number

$273.00 + 0.25$

$0.25 \times 2 = 0.5$

$0.5 \times 2 = 1.0$

$2 \lfloor 273$

$2 \lfloor 136 - 1$

$2 \lfloor 68 - 0$

$2 \lfloor 34 - 0$

$2 \lfloor 17 - 0$

$2 \lfloor 8 - 1$

$2 \lfloor 4 - 0$

$2 \lfloor 2 - 0$

$2 \lfloor 1 - 0$

$0 - 1$

$273_{10} = 100010001$ , $0.25_{10} = 01_2$

$273.25_{10} = 100010001.01_2$

---

$a(a+b)$

$= (a+0)(a+b)$

$= a + 0 \cdot b$ (distributive law)

$= a + 0$ (Null law)

$= a$ (identity law)

$g : R \rightarrow R \quad g(x) = \frac{(5x-9)}{2}$ $\qquad y = \frac{5x-9}{2}$

$2y = 5x - 9$

$2y + 9 = 5x$

$\frac{2y+9}{5} = x$

$g^{-1}(x) = \frac{2x+9}{5}$

Find $g^{-1}(3)$,

$g^{-1}(x) = \frac{2x+9}{5}$

$x = 3$ ; $\quad g^{-1}(3) = \frac{2 \times 3 + 9}{5}$

$= \frac{6+9}{5}$

$g^{-1}(3) = 3$ //

---

$(a+0+1) \cdot (b \cdot c) = (b \cdot c \cdot 1)$ $\qquad + \rightarrow - \qquad 0 \rightarrow 1$

$(a \cdot 1 \cdot 0) + (b + c) = (b + c + 0)$ $\qquad - \rightarrow + \qquad \rightarrow 0$

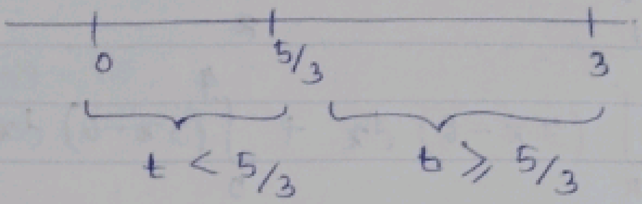
$a \cdot 1 = (a+b+c+1) \cdot a$

$a + 0 = (a \cdot b \cdot c \cdot 0) + a$

$$\int_0^3 |3t-5|\,dt \qquad |3t-5| = \begin{cases} (3t-5) & ; \ 3t-5 \geq 0 \\ & \quad t \geq 5/3 \\ -(3t-5) & ; \ 3t-5 < 0 \\ & \quad t < 5/3 \end{cases}$$

$$= \int_0^{5/3} -(3t-5)\,dt + \int_{5/3}^{3} (3t-5)\,dt$$

$$= \int_{5/3}^{0} (3t-5)\,dt + \int_{5/3}^{3} (3t-5)\,dt$$



$$= \left[\frac{3t^2}{2} - 5t\right]_{5/3}^{0} + \left[\frac{3t^2}{2} - 5t\right]_{5/3}^{3} \qquad -(3t-5) \qquad (3t-5)$$

$$= \left[(0) - \left(\frac{3}{2} \times \frac{25}{9} - \frac{25}{3}\right)\right] + \left[\left(\frac{3}{2} \times 9 - 15\right) - \left(\frac{3}{2} \times \frac{25}{9} - \frac{25}{3}\right)\right]$$

$$= -\frac{25}{6} + \frac{50}{6} + \frac{81}{6} - 15 - \frac{25}{6} + \frac{50}{6}$$

$$= \frac{131-90}{6} = \frac{41}{6}$$

(10)
$$f(x) = x^3 + 2$$
$$y = x^3 + 2$$
$$y - 2 = x^3$$
$$(y-2)^{1/3} = x$$
$$f^{-1}(x) = (x-2)^{1/3}$$

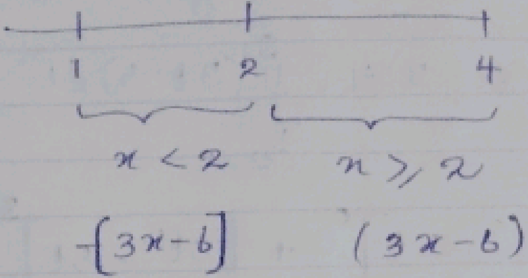
$$(a+0).(b+1) = a$$
$$(a \cdot 1) + (b \cdot 0) = a$$

(11)
$$f(x) = 2(24-5x)^{1/2}$$
$$y = 2(24-5x)^{1/2}$$
$$y^2 = \left[2(24-5x)^{1/2}\right]^2$$
$$y^2 = 4(24-5x)$$
$$\frac{y^2}{4} = 24-5x$$
$$5x = 24 - \frac{y^2}{4}$$
$$x = \frac{24 - \frac{y^2}{4}}{5}$$
$$f^{-1}(x) = \frac{24}{5} - \frac{x^2}{20}$$

ප්‍රතිලෝම
ශ්‍රිතය සෙවීම

$$\int_1^4 |3x-6|\,dx \qquad |3x-6| = \begin{cases} 3x-6 \;; & 3x-6 \geq 0 \\ & x \geq 2 \\ -(3x-6) \;; & 3x-6 < 0 \\ & x < 2 \end{cases}$$

$$= \int_1^2 -(3x-6)\,dx + \int_2^4 (3x-6)\,dx$$



$$= \int_2^1 (3x-6)\,dx + \int_2^4 (3x-6)\,dx$$

$$= \left[\frac{3x^2}{2} - 6x\right]_2^1 + \left[\frac{3x^2}{2} - 6x\right]_2^4$$

$$= \left[\left(\frac{3}{2}-6\right) - \left(\frac{3}{\cancel{2}} \times \overset{2}{\cancel{4}} - 6\times 2\right)\right] + \left[\left(\frac{3}{\cancel{2}} \times \overset{8}{\cancel{16}} - 6\times 4\right) - \left(\frac{3}{\cancel{2}} \times \overset{2}{\cancel{4}} - 6\times 2\right)\right]$$

$$= \frac{3}{2} + 6$$

$$= \frac{15}{2} \,/\!/$$

---

$2^3 \quad 2^2 \quad 2^1 \quad 2^0$

$8 \quad 4 \quad 2 \quad 1$

```
      00111000
   11|10101010
     |11
     |100
       11
       011
        11
         00
          0
          01
           0
           10
            0
           10
```

10101010 ÷ 11 ⇒ Quotient = 0111000

& Reminder = 10

$\cancel{(\sqrt{x}-3)\,(x^2-3x)}$

$= (\sqrt{x}-3)(2x-3) + \cancel{(x^2-3x)}\dfrac{1}{2\sqrt{x}}$

$\sqrt{x} = (x)^{1/2}$

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

$= \frac{1}{2}(x)^{-1/2}$

$= \dfrac{1}{2\sqrt{x}}$

$= \dfrac{\cancel{(2x-6\sqrt{x})}\,(2x-3) + \cancel{(x^2-3x)}}{2\sqrt{x}}$

$(\sqrt{x}-3)\,(x^2-3x)$ අවකලනය

$= (\sqrt{x}-3)(2x-3) + (x^2-3x)\cdot\dfrac{1}{2\sqrt{x}}$

$\sqrt{x} = (x)^{1/2}$

$= \frac{1}{2}(x)^{1/2-1}$

$= \frac{1}{2}(x)^{-1/2}$

$= \dfrac{1}{2\sqrt{x}}.$

$= (\sqrt{x}-3)(2x-3) + (x-3)\dfrac{x}{2\sqrt{x}}$

$= \dfrac{(\sqrt{x}-3)(2x-3)2 + (x-3)\sqrt{x}}{2}$

$= \dfrac{(2x\sqrt{x} - 3\sqrt{x} - 6x + 9)2 + x\sqrt{x} - 3\sqrt{x}}{2}$

$= \dfrac{5x\sqrt{x} - 9\sqrt{x} - 12x + 18}{2}$

$= \dfrac{\sqrt{x}(5x-9) - 12x + 18}{2}$ //

---

$\int (x^3 - 6x + 8)\, dx$

$\dfrac{x^4}{4} - \dfrac{\overset{3}{\cancel{6}}\,x^2}{\cancel{2}} + 8x$

$\dfrac{x^4}{4} - 3x^2 + 8x + C$

පොදු හරය ගත් විට,

$\dfrac{(x^4 - 12x^2 + 32x)}{4} + C$

x පොදුවට ගත් විට,

$\dfrac{x(x^3 - 12x + 32)}{4} + C$ //

(05)
(04)
(21)

$$\frac{d}{dx}\left[(\sqrt{x}-3)(x^2-5x)\right]$$

$$\boxed{\frac{d\sqrt{x}}{dx} = \frac{1}{2\sqrt{x}}}$$

$$= (\sqrt{x}-3)(2x-5) + (x^2-5x)\times\frac{1}{2\sqrt{x}}$$

$$= (\sqrt{x}.2x - 5\sqrt{x} - 6x + 15) + (x-5)\frac{x}{2\sqrt{x}}$$

$$\boxed{\frac{x}{2\sqrt{x}} = \frac{\sqrt{x}\times\cancel{\sqrt{x}}}{2\cancel{\sqrt{x}}} = \frac{\sqrt{x}}{2}}$$

$$= \frac{4\sqrt{x}.x - 10\sqrt{x} - 12x + 30 + x\sqrt{x} - 5\sqrt{x}}{2}$$

$$= \frac{5x\sqrt{x} - 15\sqrt{x} - 12x + 30}{2}$$

$$= \frac{\sqrt{x}(5x-15) - 12x + 30}{2}$$

---

(34) $Q = (A+B)(A+C)$

$= A\cdot A + A\cdot C + A\cdot B + B\cdot C$ Distributive law

$= A + A\cdot C + A\,B + B\cdot C$ Idempotentent law

$= A(1+C) + A\,B + B\cdot C$ Distributive law

$= A\cdot 1 + A\cdot B + B\cdot C$ Null law

$= A(1+B) + B\cdot C$ Distributive law

$= A\cdot 1 + B\cdot C$ Universal Bound law

$Q = A + (B\cdot C)$ Idetity law

Null law = Universal Bound law

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(45) A → 0111101

$$\begin{array}{r} 0111101 \\ +\,1001001 \\ \hline 10000110 \\ \hline \end{array} \qquad \begin{array}{r} 11111111 \\ -\,10000110 \\ \hline 01111001 \\ \hline \end{array} \qquad \begin{array}{r} 01111001 \\ +\,1 \\ \hline 01111010 \\ \hline \end{array}$$

1's complement

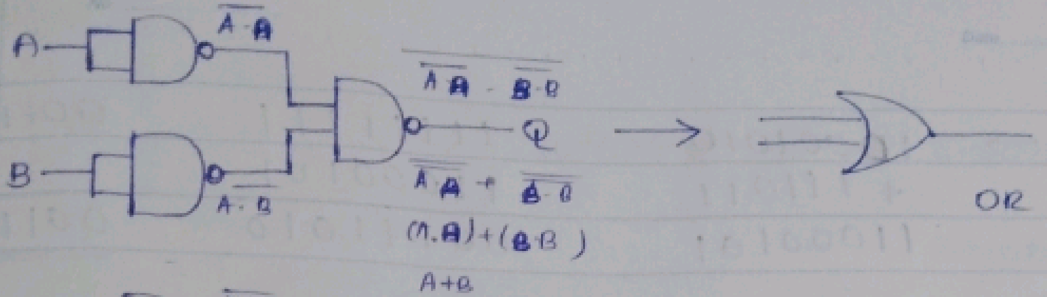
2's complement

$(r^n - 1) - N$

$(2^8 - 1) - 10000110$

$(100000000 - 1)\ 10000110$

(07)
(35)



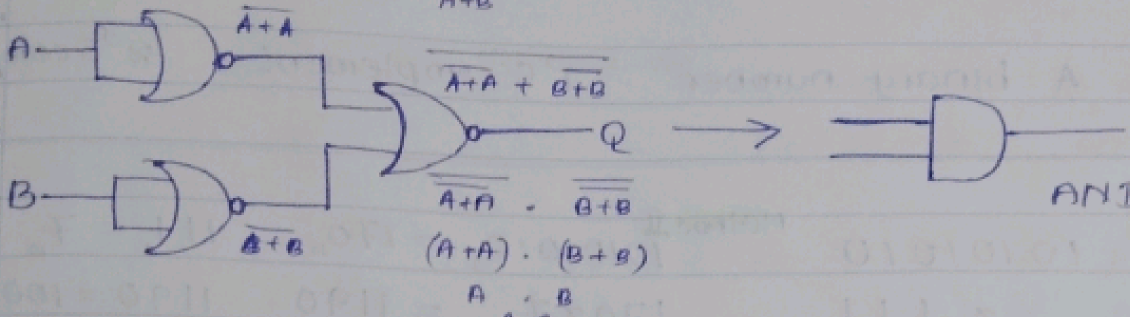
$\overline{\overline{A\cdot A}\cdot\overline{B\cdot B}}$

$\overline{\overline{A\cdot A}}+\overline{\overline{B\cdot B}}$

$(A\cdot A)+(B\cdot B)$

$A+B$

OR Gate



$\overline{\overline{A+A}+\overline{B+B}}$

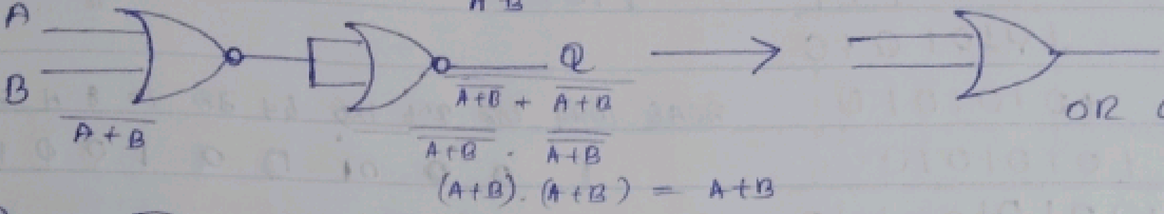
$\overline{\overline{A+A}}\cdot\overline{\overline{B+B}}$

$(A+A)\cdot(B+B)$

$A\cdot B$

$A\cdot B$

AND Gate

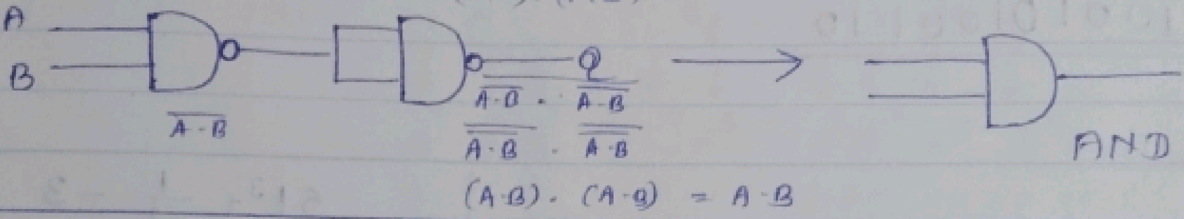


$\overline{\overline{A+B}+\overline{A+B}}$

$\overline{\overline{A+B}}\cdot\overline{\overline{A+B}}$

$(A+B)\cdot(A+B)=A+B$

OR Gate.



$\overline{\overline{A\cdot B}\cdot\overline{A\cdot B}}$

$\overline{\overline{A\cdot B}}\cdot\overline{\overline{A\cdot B}}$

$(A\cdot B)\cdot(A\cdot B)=A\cdot B$

AND Gate.

---

B + 1 = 1 → Universal Bound law

C + 0 = C → Identity law

A . A = A → Idempotent law

---

$168_{10}$ → base 5

$$\begin{array}{r|l} 5 & 168 \\ 5 & 33 - 3 \\ 5 & 6 - 3 \\ 5 & 1 - 1 \\ & 0 - 1 \end{array}$$

$168_{10} = 1133_5$

$100110110100 1_2$ → 1's complement

$$\begin{array}{r} 1111111111111 \\ 1001101101001 \\ \hline 0110010010110 \end{array}$$

$(a+0)\cdot(b+1)=a$

$(a\cdot 1)+(b\cdot 0)=a$

$$A \rightarrow \begin{array}{r} 10001010 \\ +\ 111011 \\ \hline 11000101 \end{array} \qquad \begin{array}{r} 11111111 \\ 11000101 \\ \hline 00111010 \end{array} \qquad \begin{array}{r} 00111010 \\ +\ 1 \\ \hline \underline{\underline{00111011}} \end{array}$$

A binary number      1's complement      2's complement

---

**Method I**

$$\begin{array}{r} 10101010 \\ \times\ 111 \\ \hline 10101010 \\ 10101010\phantom{0} \\ 10101010\phantom{00} \\ \hline 10010100110 \end{array}$$

**Method II** $10101010_2 = 170_{10}$   $111_2 = 7_{10}$

$170 \times 7 = 1190$   $1190_{10} = 10010100110$

| 2048 | 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

$$\begin{array}{r} 1190 \\ 1024 \\ \hline 166 \\ 128 \\ \hline 38 \\ 32 \\ \hline 06 \\ 4 \\ \hline 2 \end{array}$$

---

(12) $167_{10} \longrightarrow$ base 11

$$\begin{array}{r|l} 11 & 167 \\ \hline 11 & 15 - 2 \\ \hline 11 & 1 - 4 \\ \hline & 0 - 1 \end{array}$$

$167_{10} = 142_{11}$

$$5t^3 + \frac{1}{t^{\frac{5}{2}}} - 3$$

$$= 5 \cdot 3t^2 + -\frac{5}{2} t^{-\frac{5}{2}-1} - 0$$

$$= 15t^2 - \frac{5}{2} t^{-7/2}$$

$$= 15t^2 - \frac{5}{2t^{7/2}} \ //$$

---

$221122_3$

$$\begin{array}{cccccc} 2 & 2 & 1 & 1 & 2 & 2 \\ 3^5 & 3^4 & 3^3 & 3^2 & 3^1 & 3^0 \\ (243) & (81) & (27) & (9) & (3) & (1) \end{array}$$

$$221122_3 = \left[(243 \times 2) + (81 \times 2) + (27 \times 1) + (9 \times 1) + (2 \times 3) + (2 \times 1)\right]$$

$$= 486 + 162 + 27 + 9 + 6 + 2$$

$$221122_3 = 692_{10} \ //$$

Method I

$$\begin{array}{r|l} & 1010101 \\ \hline 10 & 10101010 \\ & 10 \\ \hline & 01 \\ & 0 \\ \hline & 10 \\ & 10 \\ \hline & 01 \\ & 0 \\ \hline & 10 \\ & 10 \\ \hline & 01 \\ & 0 \\ \hline & 10 \\ & 10 \\ \hline & 0 \end{array}$$

$10101010 \div 10 =$ Quotient 1010101
&
Reminder 00

Method II

$10101010_2 = 170$, $10_2 = 2$
$170 \div 2 = 85$, $85 = 1010101_2$

| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|---|---|---|---|---|---|---|---|
|  | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

$$\begin{array}{r} 85 \\ 64 \\ \hline 21 \\ 16 \\ \hline 5 \end{array}$$

---

100111.1101

$$\begin{array}{cccccccccccc} 1 & 0 & 0 & 1 & 1 & 1 & . & 1 & 1 & 0 & 1 \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & & \downarrow & \downarrow & \downarrow & \downarrow \\ 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 & . & 2^{-1} & 2^{-2} & 2^{-3} & 2^{-4} \\ 32 & 16 & 8 & 4 & 2 & 1 & & 0.5 & 0.25 & 0.125 & 0.0625 \end{array}$$

$$100111.1101_2 = \left[(1\times1)+(2\times1)+(4\times1)+(32\times1)\right] + \left[(0.5\times1)+(0.25\times1)+0.625\times1)\right]$$

$$= (1+2+4+32) + (0.5+0.25+0.625)$$

$$\begin{array}{r} 0.0625 \\ 0.25 \\ 0.5 \\ \hline 0.8125 \end{array}$$

$$= 39 + 0.8125$$

$$100111.1101_2 = 39.8125_{10}$$ //

---

$2^{-1} = 0.5$
$2^{-2} = 0.25$
$2^{-3} = 0.125$
$2^{-4} = 0.0625$
$2^{-5} = 0.03125$

(02) $\frac{d}{dx}\left(x^{-2} - 3x + 3\right)$
$= -2 \cdot x^{-2-1} - 3x^{1-1} + 0$
$= \frac{-2}{x^3} - 3$ //

(03) $\int_0^4 g(s)\,ds = g(4) - g(0)$ —— ①

$\int_4^0 g(s)\,ds = g(0) - g(4) = \frac{21}{8}$ —— ②

② × (−1) $\underbrace{g(4) - g(0)} = \frac{-21}{8}$

$\therefore \int_0^4 g(s)\,ds = \frac{-21}{8}$ //

---

(04) $\frac{d}{dx} \cdot \left(x^3-1\right)^2 - x^6 + \sqrt{x} - 1$

$2\left(x^3-1\right) \cdot 3x^2 - 6x^5 + \frac{1}{2\sqrt{x}} - 0$

$\cancel{6x^5} - 6x^2 - \cancel{6x^5} + \frac{1}{2\sqrt{x}} - 0$

$\frac{-12x^2+1}{2(x)^{\frac{1}{2}}}$

$\sqrt{x} = (x)^{1/2}$

$= \frac{1}{2}x^{\frac{1}{2}-1}$

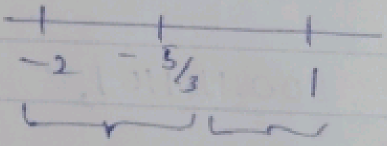
$= \frac{1}{2}x$

---

(77) [illegible]
([illegible])
කිරීමට
[illegible], −5/3 මායිම සටහන් කළ යුතුය.

$\int_{-2}^{1} |3x+5|\,dx$ $\quad |3x+5| = \begin{cases} 3x+5 & ; \ 3x+5 \geq 0 \\ & \quad x \geq -5/3 \\ -(3x+5) & ; \ 3x+5 < 0 \\ & \quad x < -5/3 \end{cases}$

$= \int_{-2}^{-5/3} -(3x+5)\,dx + \int_{-5/3}^{1} (3x+5)\,dx$



$= \left[\frac{3x^2}{2} + 5x\right]_{-5/3}^{-2} + \left[\frac{3x^2}{2} + 5x\right]_{-5/3}^{1}$

$\left[(6-10) - \left(\frac{25}{6} - \frac{25}{3}\right)\right] + \left[\left(\frac{3}{2} + 5\right) - \left(\frac{25}{6} - \frac{25}{3}\right)\right]$

$\frac{1}{6} + \frac{32}{3}$

$\frac{1+64}{6}$

$65/6$ //

(13) $4221_5 \longrightarrow$ base 10

$$\underset{5^3}{4} \quad \underset{5^2}{2} \quad \underset{5^1}{2} \quad \underset{5^0}{1}$$
$$(125) \quad (25) \quad (5) \quad (1)$$

$4221_5 = \left[(4\times125)+(25\times2)+(5\times2)+(1\times1)\right]$
$= 500 + 50 + 5 + 1$
$= 556_{10}$

---

(14) $\frac{d}{dx}\left[\frac{x^2-9}{2x+1}\right]$

$= \frac{(2x+1)2x-(x^2-9)\cdot2}{(2x+1)^2}$

$= \frac{4x^2+2x-2x^2+18}{(2x+1)^2}$

$= \frac{2x^2+2x+18}{(2x^2+1)^2}$

$= \frac{2\cdot(x^2+x+9)}{(2x^2+1)^2}$ //

$\frac{d}{dx}\left[\frac{x^2-3}{2x+1}\right]$

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

$= \frac{2x^2+2x+6}{(2x+1)^2}$

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

(17) AB+A
A B + A·1 (Identity law)
A ( B + 1) (Distributive law)
A · 1 (Universal Bound)
A (Identity law)

---

(20) $5t^3+1/t^{\frac{3}{2}}-3$

$5\cdot3t^2+-\frac{3}{2}t^{-\frac{3}{2}-1}-0$

$15t^2-\frac{3}{2}t^{-\frac{5}{2}}$

$15t^2-\frac{3}{2t^{\frac{5}{2}}}$

---

~~$(2x-1)^4+(x^2-2)^2$~~
~~$=4(2x-1)^3_2+{}_2\,2(x^2-2)$~~
~~$=4\left((2x)^3-(2x)^2 3+(2x)1^2\cdot3-1^3\right)+2x^2-4$~~
~~$=4\left(8x^3-12x^2+6x-1\right)+2x^2-4$~~
~~$=32x^3-48x^2+24x-4+2x^2-4$~~
~~$=32x^3-46x^2+24x-8$~~

(27) $(2x-1)^4 + (x^2-2)^2$

$= 4(2x-1)^3 \cdot 2 + 2(x^2-2) \cdot 2x$

$= 8(8x^3 - 12x^2 + 6x - 1) + 4x^3 - 8x$

$= 64x^3 - 96x^2 + 48x - 8 + 4x^3 - 8x$

$= 68x^3 - 96x^2 + 40x - 8$ //

---

(28) $\int (x^3 - 5x + 8)\, dx$

$= \frac{x^4}{4} - \frac{5x^2}{2} + 8x$

$= \frac{x^4 - 10x^2 + 32x}{4}$

$= \frac{x(x^3 - 10x + 32)}{4} + C$ //

(29) $-12x^2 + x^{\frac{3}{2}} - 3$

$= -12 \cdot 2x + \frac{3}{2} x^{\frac{3}{2}-1} - 0$

$= -24x + \frac{3}{2}\sqrt{x}$

$= \frac{3}{2}\sqrt{x} - 24x$ //

---

~~$(\sqrt{x}-3)(x^2-3x)$~~

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

~~$= 2x\sqrt{x} - 6x + \frac{(x-3)x}{2\sqrt{x}}$~~

$\left( x = \sqrt{x} \times \sqrt{x} = \frac{\sqrt{x} \times \sqrt{x}}{\sqrt{x}} \right)$

~~$= \frac{4x\sqrt{x} - 12x +}{2}$~~

~~$= 5x\sqrt{x} - 12x -$~~

(30) $(\sqrt{x}-3)(x^2-3x)$

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

$= (2x\sqrt{x} - 3\sqrt{x} - 6x + 9) + \frac{(x-3)x}{2\sqrt{x}}$

$= \frac{4x\sqrt{x} - 6\sqrt{x} - 12x + 18 + x\sqrt{x} - 3\sqrt{x}}{2}$

$= \frac{5x\sqrt{x} - 9\sqrt{x} - 12x + 18}{2}$

$= \frac{\sqrt{x}(5x-9) - 12x + 18}{2}$ //

(42) $125.125_{10} \longrightarrow$ binary number

$125 + 0.125$

(M-I)

$$\begin{array}{r|l}
2 & 125 \\
2 & 62 - 1 \\
2 & 31 - 0 \\
2 & 15 - 1 \\
2 & 7 - 1 \\
2 & 3 - 1 \\
2 & 1 - 1 \\
 & 0 - 1
\end{array}$$

125
64
61
32
29
16
13
8
5

(M-II)

| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|---|---|---|---|---|---|---|---|
|  | 1 | 1 | 1 | 1 | 1 | 0 | 1 |

$0.125_{10} \rightarrow 0.125 \times 2 = 0.25$

$0.25 \times 2 = 0.5$

$0.5 \times 2 = 1.0$

$0.125_{10} = 001_2$

$125.125_{10} = 1111101.001_2$ //

---

1000111011001

$(r^n - 1) - N$

$(2^{13} - 1) - 1000111011001$

$$\begin{array}{r}
1111111111111 \\
-1000111011001 \\
\hline
0111000100110
\end{array}$$

1's complement

$168_{10} \rightarrow$ base 3

---

(57)

$$\begin{array}{r|l}
3 & 168 \\
3 & 56 - 0 \\
3 & 18 - 2 \\
3 & 6 - 0 \\
3 & 2 - 0 \\
 & 0 - 2
\end{array}$$

$166_{10} = 20020_3$

(32)

$$\frac{d}{dx}\left[\left(2\sqrt{x} - 3\right)\left(x^2 - 4x\right)\right]$$

$$= \left(2\sqrt{x} - 3\right)\left(2x - 4\right) + \left(x^2 - 4x\right)\left(\cancel{2} \times \frac{1}{\cancel{2}\sqrt{x}}\right)$$

$$= \left(4x\sqrt{x} - 8\sqrt{x} - 6x + 12\right) + (x - 4)\, x/\sqrt{x}$$

$$= 4x\sqrt{x} - 6\sqrt{x} - 6x + 12 + x\sqrt{x} - 4\sqrt{x}$$

$$= 5x\sqrt{x} - 12\sqrt{x} - 6x + 12$$

$$= \sqrt{x}\,(5x - 12) - 6x + 12$$ //

---

(55) $$\int x^3 - 2x + 5 \; dx$$

$$= \frac{x^4}{4} - \frac{\cancel{2}x^2}{\cancel{2}} + 5x$$

$$= \frac{x^4}{4} - x^2 + 5x$$

$$= \frac{x^4 - 4x^2 + 20x}{4}$$

$$= \frac{x\left(x^3 - 4x + 20\right)}{4}$$ //

# MID EXAM - MC

(01)

```
     11100011
     ×    101
  -----------
     11100011
    00000000
   11100011
  -----------
  10001101111
```

|  |  |
|---|---|
| 1 × 1 = 1 | 1 + 1 = 10 |
| 1 × 0 = 0 | 1 + 0 = 1 |
| 0 × 1 = 0 | 0 + 1 = 1 |
| 0 × 0 = 0 | 0 + 0 = 1 |

(a)

$\bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$

$\bar{A}B\bar{C} + \bar{A}B\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$ (Rewrite)

$\bar{A}\bar{C}(B + \bar{B}) + \bar{B}\bar{C}(A + \bar{A})$

$\bar{A}\bar{C} \cdot 1 + \bar{B}\bar{C} \cdot 1$

$\bar{A}\bar{C} + \bar{B}\bar{C}$

$\bar{C}(\bar{A} + \bar{B})$

$1061_8 \longrightarrow$ 10 base.

```
8 | 1061
8 | 132 - 5
8 | 16  - 4
8 | 2   - 0
    0   - 2
```

(56)
(32) $\int (x^3 - 2x + 5)\,dx$

$= \frac{x^4}{4} - \frac{\cancel{2}x^2}{\cancel{2}} - 5x$

$= \frac{x^4 - 4x^2 - 20x}{4}$

$= \frac{x(x^3 - 4x - 20)}{4}$

(31) $\int_0^3 h(t)\,dt = h(3) - h(0)$

$\int_3^0 h(t)\,dt = h(0) - h(3)$

$\underbrace{\qquad\qquad}_{6} = h(0) - h(3)$

$-6 = -h(0) + h(3)$

$\therefore h(3) - h(0) = -6$ //

(35) $\int_1^7 x^2\,dx$

$= \frac{[x^3]_1^7}{3}$

$= \frac{1}{3}[7^3 - 1^3]$

$= \frac{1}{3}[343 - 1]$

$= \frac{1}{3} \times 342$

$= 114$ //

$49 \times 7 = 343$

(63) $300.75_{10} \rightarrow$ binary number

$300 + 0.75$

$2\underline{|300}$
$2\underline{|150} - 0$
$2\underline{|75} - 0$
$2\underline{|37} - 1$
$2\underline{|18} - 1$
$2\underline{|9} - 0$
$2\underline{|4} - 1$
$2\underline{|2} - 0$
$2\underline{|1} - 0$
$0 - 1$

$0.75 \times 2 = 1.50$
$0.5 \times 2 = \ .0$

$300.75_{10}$
$\downarrow$
$100101100.11_2$

---

(67) $\int \left(x^3 - 6x + 8\right) dx$

$= \frac{x^4}{4} - \frac{\overset{3}{\cancel{6}}x^3}{\cancel{2}_1} + 6x$

$= \frac{x^4}{4} - 8x^3 + 8x$

$= x\frac{(x^3 - 12x^2 + 32)}{4}$ //

---

(72)
$361_9 \rightarrow$ decimal number

$3 \quad 6 \quad 1$
$(9^2) \ (9^1) \ (9^0)$
$81 \quad 9 \quad 1$

$361_9 = [(81 \times 3) + (6 \times 9) + (1 \times 1)]$
$= 243 + 54 + 1$
$= 298$ //

---

(74) $a \cdot 1 = (a + b + c + 1) \ a$
$a + 0 = (a \cdot b \cdot c \cdot 0) \ a$

---

(65) $\int_{-1}^{1} \frac{(x+2)^2}{x^4} dx = \int_{-1}^{1} \frac{(x^2 + 4x + 4)}{x^4} dx$

උඩ එකින් එක (පදයක් ගානේ) $x^4$ න් බෙදන්න

$= \int_{-1}^{1} \left(\frac{x^2}{x^4} + \frac{4x}{x^4} + \frac{4}{x^4}\right) dx$

$= \int_{-1}^{1} \left(\frac{1}{x^2} + \frac{4}{x^3} + \frac{4}{x^4}\right) dx$

$= \left[-\frac{1}{x} - \frac{4x}{2x^2} - \frac{4}{3x^3}\right]_{-1}^{1}$

$= \left[\left(-1 - 2 - 4/3\right) - \left(1 - 2 + 4/3\right)\right]$

$= \left(-13/3 - 1/3\right) = -14/3$ //

හෝ

$= \left[-\frac{(x+2)}{x^2} - \frac{4}{3x^3}\right]_{-1}^{1}$

$= \left[\left(-3 - \frac{4}{3}\right) - \left(-1 + \frac{4}{3}\right)\right]$

$= \frac{-13}{3} - \frac{1}{3} = -14/3$ //

---

(64) $x^{-2} - 3x + 3$ (අවකලනය)

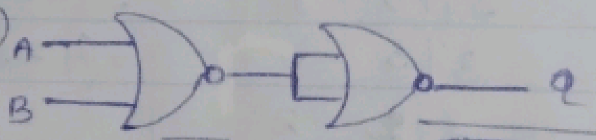
$= -2x^{-2-1} - 3x^{1-1}$

$= -2x^{-3} - 3x^0$ $\quad [x^0 = 1]$

$= \frac{-2}{x^3} - 3$ //

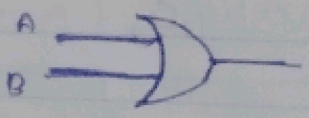
---

(69)



$\overline{A+B}$ $\qquad \overline{(\overline{A+B}) + (\overline{A+B})}$

(De morgan's law) $\quad \overline{(\overline{A+B})} \cdot \overline{(\overline{A+B})}$



$(A+B) \cdot (A+B)$
$A + B$

(78) $167_{10} \longrightarrow$ base 11

$$\begin{array}{r|l} 11 & 167 \\ 11 & 15 - 2 \\ 11 & 1 - 4 \\ & 0 - 1 \end{array}$$

$167_{10} = 142_{11}$ //

√x හි ව්‍යුත්පන්නය

(79) $(\sqrt{x}-3)\,(x^2-3x)$

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

$= (2x\sqrt{x} - 3\sqrt{x} - 6x + 9) + (x-3)\,\frac{x}{2\sqrt{x}}$

$= \frac{4x\sqrt{x} - 6\sqrt{x} - 12x + 18 + x\sqrt{x} - 3\sqrt{x}}{2}$

$= \frac{5x\sqrt{x} - 9\sqrt{x} - 12x + 16}{2}$

$= \frac{\sqrt{x}(5x-9) - 12x + 18}{2}$ //

(80) $\frac{d}{dx}\left[(\sqrt{x}-3)(x^2-4x)\right]$

$= (\sqrt{x}-3)(2x-4) + (x^2-4x) \times \frac{1}{2\sqrt{x}}$

$= 2x\sqrt{x} - 4\sqrt{x} - 6x + 12 + (x-4) \times \frac{x}{2\sqrt{x}}$

$= \frac{4x\sqrt{x} - 8\sqrt{x} - 12x + 24 + x\sqrt{x} - 4\sqrt{x}}{2}$

$\frac{5x\sqrt{x} - 12\sqrt{x} - 12x + 24}{2}$

$\frac{\sqrt{x}(5x-12) - 12 + 24}{2}$ //

$x = \sqrt{x} \times \sqrt{x}$

$\times \frac{1}{2\sqrt{x}} = \frac{\sqrt{x} \times \cancel{\sqrt{x}}}{2\cancel{\sqrt{x}}}$

$= \frac{\sqrt{x}}{2}$

(81)

$a(a+b)$

$= (a+0)(a+b)$

$= a + (0 \cdot b)$ (Distributive law)

$= a + 0$ (universal Bound)

$= a$ (Identity law)

(82)

| x | y | z | F | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | |
| 0 | 0 | 1 | 0 | |
| 0 | 1 | 0 | 0 | |
| 0 | 1 | 1 | 1 | $\rightarrow \bar{x}yz$ |
| 1 | 0 | 0 | 0 | |
| 1 | 0 | 1 | 1 | $\rightarrow x\bar{y}z$ |
| 1 | 1 | 0 | 1 | $\rightarrow xy\bar{z}$ |
| 1 | 1 | 1 | 1 | $\rightarrow xyz$ |

(83) $24t^2 + \frac{1}{t^{3/2}} - 3$

$= 24 \cdot 2t + -\frac{3}{2}\,t^{-\frac{3}{2}-1} - 0$

$= 48t - \frac{3}{2}\,t^{-5/2}$

$= 48t - \frac{3}{2t^{5/2}}$ //

(84) $(a+0) \cdot (b+1) = a$

$(a \cdot 1) + (b+0) = a$

$\cdot \rightarrow +$ $\quad 1 \rightarrow 0$

$+ \rightarrow \cdot$ $\quad 0 \rightarrow 1$

---

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

$= 4(2x-1)^3 \cdot 2 + 2(x^2-2)\,2x$

$= 8(8x^3-12x^2+6x-1) + 4x^3-8x$

$= 64x^3-96x^2+48x-8+4x^3-8x$

$= 68x^3-96x^2+40x-8$ //

---

(87) $\frac{d}{dx}\left[(2x-3)^4 + (x^2+2)^2\right]$

$= 4(2x-3)^3\,2 + 2(x^2+2)\,2x$

$= 8(8x^3-36x^2+54x-27)+4x^3+8x$

$= 64x^3-288x^2+432x-216+4x^3+8x$

$= 68x^3-288x^2+440x-216$ //

---

88) Associative law

$A+(B+C) = (A+B)+C$

$A \cdot (B \cdot C) = (A \cdot B) \cdot C$

Identity law

$A+0 = A$ , $A \cdot 1 = A$

Distributive law

$A+(B \cdot C) = (A+B) \cdot (A+C)$

$A \cdot (B+C) = (A \cdot B) + (A \cdot C)$

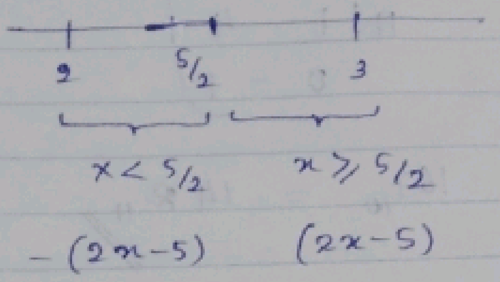
---

) $a \cdot 1 = (a+b+c+1) \cdot a$

$a+0 = (a \cdot b \cdot c \cdot 0) + a$

(85) $\int_2^3 |2x-5|\,dx$

$$|2x-5| = \begin{cases} 2x-5 & ;\ 2x-5 \geq 0 \\ & \quad x \geq 5/2 \\ -(2x-5) & ;\ 2x-5<0 \\ & \quad x<5/2 \end{cases}$$



$$= \int_2^{5/2} -(2x-5)\,dx + \int_{5/2}^3 (2x-5)\,dx$$

$$= \int_{5/2}^2 (2x-5)\,dx + \int_{5/2}^3 (2x-5)\,dx$$

$$= \left[x^2-5x\right]_{5/2}^2 + \left[x^2-5x\right]_{5/2}^3$$

$$= \left[(4-10)-\left(\frac{25}{4}-\frac{25}{2}\right)\right] + \left[(9-15)-\left(\frac{25}{4}-\frac{25}{2}\right)\right]$$

$$= \left(-6+\frac{25}{4}\right) + \left(-6+\frac{25}{4}\right)$$

$$= \frac{1}{4}+\frac{1}{4}$$

$$= \frac{1}{2}$$ //

---

(90) $(2x-1)^4 + (x^2-2)^2$

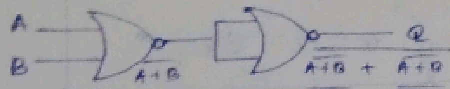
$= 4(2x-1)^3 \cdot 2 + (x^2-2)\,2x \cdot 2$

$= 8(8x^3-12x^2+6x-1)+4x^3-8x$

$= 64x^3-96x^2+48x-8+4x^3-8x$

$= 68x^3-96x^2+40x-8$ //

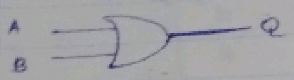
(91)



$\overline{\overline{A+B} + \overline{A+B}}$

$\overline{\overline{A+B}} \cdot \overline{\overline{A+B}}$

$\Downarrow$



$(A+B)\cdot(A+B)$

$A+B$ //

(92) $\frac{d}{dx}\left[(2x-3)^4+(x^2+2)^2\right]$

$= 4(2x-3)^3\cdot 2 + 2(x^2+2)2x$

$= 8(8x^3-36x^2+54x-27)+4x^3+8x$

$= 64x^3-288x^2+432x-216+4x^3+8x$

$= 68x^3-288x^2+440x-216$ //

(93) $(2x-1)^4+(x^2-2)^2$

$= 4(2x-1)^3\cdot 2 + 2(x^2-2)\cdot 2x$

$= 8(8x^3-12x^2+6x-1)+4x^3-8x$

$= 64x^3-96x^2+48x-8+4x^3-8x$

$= 68x^3-96x^2+40x-8$ //

(94) $\bar{A}B\bar{C} + A\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$

$= \bar{A}B\bar{C} + \bar{A}\bar{B}\bar{C} + AB\bar{C} + \bar{A}\bar{B}\bar{C}$

$= \bar{A}\bar{C}\underbrace{(B+\bar{B})}_{1} + \bar{B}\bar{C}\underbrace{(A+\bar{A})}_{1}$

(inverse law)

$= \bar{A}\bar{C}\cdot 1 + \bar{B}\bar{C}\cdot 1$

$= (\bar{A}+\bar{B})\bar{C}$ //

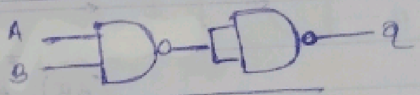
(95) $\frac{d}{dx}\left[(2x-3)^4+(x^2-3)^2\right]$

$= 4(2x-3)^2\cdot 2 + 2(x^2-3)\cdot 2x$

$= 8(8x^3-36x^2+54x-27)+4x^3-12x$

$= 64x^3-285x^2+432x-216+4x^3-12x$

$= 68x^3-288x^2+420x-216$ //

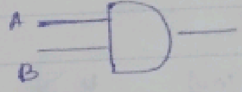


$\overline{\overline{A\cdot B}\cdot\overline{A\cdot B}}$

$= \overline{(\overline{A\cdot B})} + \overline{(\overline{A\cdot B})}$

$= (A\cdot B) + (A\cdot B)$

$= A\cdot B$ //



(97) $\int_1^7 x^2\,dx$

$= \frac{[x^3]_1^7}{3}$

$= \frac{1}{3}[7^3-1^3]$

$= \frac{1}{3}[343-1]$

$= \frac{1}{3}\times 342$

$= 114$ //

(99)

$(x^3-1)^2-x^6+\sqrt{x}-1$

$= 2(x^3-1)\cdot 3x^2 - 6x^5 + \frac{1}{2\sqrt{x}} - 0$

$= 6x^2(x^3-1) - 6x^5 + \frac{1}{2\sqrt{x}}$

$= \cancel{6x^5} - 6x^2 - \cancel{6x^5} + \frac{1}{2\sqrt{x}}$

$= \frac{-6x^2\times 2\sqrt{x}+1}{2\sqrt{x}}$

$= \frac{-12x^{\frac{5}{2}}+1}{2\sqrt{x}}$ //

(100) $\frac{d}{dx}\left[(\sqrt{x}-3)(x^2-4x)\right]$

$= (\sqrt{x}-3)(2x-4) + (x^2-4x) \times \frac{1}{2\sqrt{x}}$

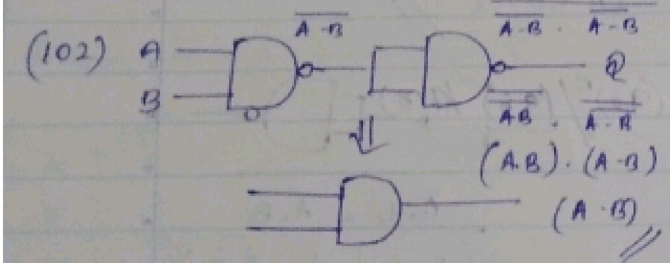
$= (2x\sqrt{x} - 4\sqrt{x} - 6x + 12) + (x-4) \times \frac{x}{2\sqrt{x}}$

$= \frac{4x\sqrt{x} - 8\sqrt{x} - 12x + 24 + x\sqrt{x} - 4\sqrt{x}}{2}$

$= \frac{5x\sqrt{x} - 12\sqrt{x} - 12x + 24}{2}$

$= \frac{\sqrt{x}(5x-12) - 12x + 24}{2}$

(102)



$(A.B).(A\cdot B)$

$(A\cdot B)$ //

(104) $v \geq 550$

(179) $f(x) = x^3+2$

$y = x^3+2$

$(y-2)^{1/3} = x$

$f^{-1}(x) = (x-2)^{1/3}$ //

(101) $\int_{-3}^{3} x^3 - x \; dx$

$= \left[\frac{x^4}{4} - \frac{x^2}{2}\right]_{-3}^{3}$

$= \left(\frac{3^4}{4} - \frac{3^2}{2}\right) - \left(\frac{(-3)^4}{4} - \frac{(-3)^2}{2}\right)$

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

$= 0$ //

(103) $-12x^2 + x^{3/2} - 3$

$= -12 \cdot 2x + \frac{3}{2}x^{\frac{3}{2}-1} - 0$

$= -24x + \frac{3}{2}x^{1/2}$

$= \frac{3}{2}\sqrt{x} - 24x$ //

(105) A → 0111101

| | |
|---|---|
| $+1001001$ | $11111111$ |
| $10000110$ | $-10000110$ |
| | $01111001$ |
| | 1's complement |

$(r^n-1) - N$

$(2^8-1) - 10000110$

$(100000000-1) - 10000110$

$(11111111 - 10000110)$

$01111001$

$+1$

$01111010$

2's complement

(106) A function is said to be one to one if and only if $f(a) = f(b)$ implies that $a=b$ for all $a$ and $b$ in the domain of $f$.

$5t^3 + \frac{1}{t^{5/2}} - 3$ $\frac{1}{t^{5/2}} = t^{-5/2}$

$5 \times 3 \times t^{3-1} + \left(-\frac{5}{2} t^{-5/2-1}\right) - 0$

$= 15t^2 - \frac{5}{2}t^{-7/2}$

$= 15t^2 - \frac{5}{2^{7/2}}$ //

(110) $\int_{3\pi/2}^{0} f(x)\,dx = f(0) - f\left(\frac{3\pi}{2}\right)$ —— ①

$\underbrace{\int_{0}^{3\pi/2} f(x)\,dx}_{\frac{21}{4}} = f\left(\frac{3\pi}{2}\right) - f(0)$ —— ②

$\frac{21}{4} = f\left(\frac{3\pi}{2}\right) - f(0)$

② $\times(-1)$ $-\frac{21}{4} = -f\left(\frac{3\pi}{2}\right) + f(0)$

$\underbrace{f(0) - f\left(\frac{3\pi}{2}\right)}$ $= -\frac{21}{4}$

$\int_{3\pi/2}^{0} f(x)\,dx = -21/4$ //

(114) $A + \bar{A}B = A \cdot 1 + \bar{A}B$

$= A(1+B) + \bar{A}B$

$= A + AB + \bar{A}B$

$= A + B(A + \bar{A})$ (Distributive)

$= A + B$ (inverse law)

(108) $a(a+b)$ (111) (123)

$= (a+0)(a+b)$

$= a + 0 \cdot b$

$= a + 0$ (Universal Bound)

$= a$ (Identity law)

ගොඩක් දුකෙන් කළ ප්‍රශ්න

MC - 1st semester mid 2021

235 pages pdf එකම

ඇතුළත්ය.

(112) 1000111011001 → 1's Com

$$\begin{array}{r} 1111111111111 \\ -1000111011001 \\ \hline 0111000100110 \\ \hline\hline \end{array}$$

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(113)
(115) $\int_{0}^{21/4} f(t)\,dt = f(21/4) - f(0)$ —— ①

$\underbrace{\int_{21/4}^{0} f(t)\,dt}_{7} = f(0) - f(21/4)$

$= f(0) - f(21/4)$ ←—— ②

② $\times(-1)$ $\underbrace{f(21/4) - f(0)} = -7$

$\int_{0}^{21/4} f(t)\,dt = -7$ //

(117) $(a \cdot b \cdot c \cdot 0) = (a + b + 1) \cdot 0$

$a + b + c + 1 = (a \cdot b \cdot 0) + 1$

(118) $(\sqrt{x}-3)(x^2-3x)$ අවකලනය.

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

$$= (2x\sqrt{x} - 3\sqrt{x} - 6x + 9) + (x-3)\, x \times \frac{1}{2\sqrt{x}}$$

$$= \frac{4x\sqrt{x} - 6\sqrt{x} - 12x + 18 + x\sqrt{x} - 3\sqrt{x}}{2}$$

$$= \frac{5x\sqrt{x} - 9\sqrt{x} - 12x + 18}{2}$$

$$= \frac{\sqrt{x}(5x-9) - 12x + 18}{2}$$

//

(119) $\frac{d}{dx}\left[(\sqrt{x}-3)(x^2-4x)\right]$

$$= (\sqrt{x}-3)(2x-4) + (x^2-4x) \times \frac{1}{2\sqrt{x}}$$

$$= 2x\sqrt{x} - 4\sqrt{x} - 6x + 12 + (x-4)\frac{x}{2\sqrt{x}}$$

$$= \frac{4x\sqrt{x} - 8\sqrt{x} - 12x + 24 + x\sqrt{x} - 4\sqrt{x}}{2}$$

$$= \frac{5x\sqrt{x} - 12\sqrt{x} - 12x + 24}{2}$$

$$= \frac{\sqrt{x}(5x-12) - 12x + 24}{2}$$

//

(120) $24t^2 + \frac{1}{t^{3/2}} - 3$

$$= 24t^2 + t^{-3/2} - 3$$

$$= 24 \cdot 2t - \frac{3}{2}t^{-\frac{3}{2}-1} - 0$$

$$= 48t - \frac{3}{2}t^{-5/2}$$

$$= 48t - \frac{3}{2t^{5/2}}$$

(122) $f(x) = x^3 + 2$

$$y = x^3 + 2$$

$$y - 2 = x^3$$

$$(y-2)^{1/3} = x$$

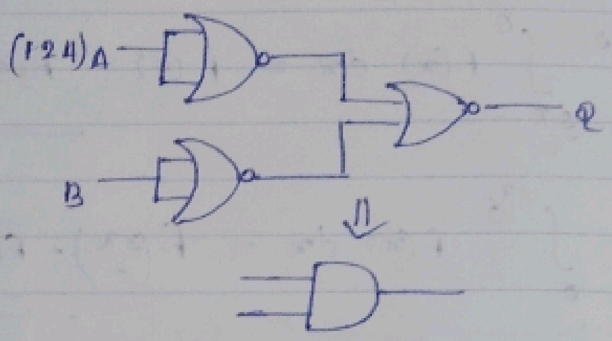
$$f^{-1}(x) = (x-2)^{1/3}$$

//

(123) $a \cdot 1 = (a+b+c+1) \cdot a$

$a \cdot 0 = (a \cdot b \cdot c \cdot 0) + a$

(124)



(126) ප්‍රශ්නය නොපැහැදිලි නිසා.

(127) $f(x) = 2(24-5x)^{1/2}$

$$y = 2(24-5x)^{1/2}$$

$$y^2 = \left[2(24-5x)^{1/2}\right]^2$$

$$y^2 = 4(24-5x)^{1/2}$$

$$\frac{y^2}{4} = (24-5x)$$

$$5x = 24 - \frac{y^2}{4}$$

$$x = \frac{24 - \frac{y^2}{4}}{5}$$

$\left(24 - \frac{y^2}{4}\right) \div 5$

$\left(\frac{24}{5} - \frac{y^2}{4 \times 5}\right)$

$$f^{-1}(x) = \frac{24}{5} - \frac{y^2}{20}$$

//

(128) $AB + A$

$= AB + A \cdot 1$ (Identity law)

$= A(B+1)$ (Distributive law)

$= A \cdot 1$ (Universal Bound)

$= A$ (Identity law)

(129) $(2x-1)^4 + (x^2-2)^2$

$= 4(2x-1)^3 \cdot 2 + 2(x^2-2) \cdot 2x$

$= 8(6x^3 - 12x^2 + 6x - 1) + 4x^3 - 8x$

$= 64x^3 - 96x^2 + 48x - 8 + 4x^3 - 8x$

$= 68x^3 - 96x^2 + 40x - 8$ //

(130) $\int_0^2 12x(x+1)(2-x)\,dx$

$= \int_0^2 12x(2+x-x^2)\,dx$

$= \int_0^2 (24x + 12x^2 - 12x^3)\,dx$

$= \left[\overset{12}{\cancel{24}} \times \frac{x^2}{\cancel{2}} + \overset{4}{\cancel{12}} \times \frac{x^3}{\cancel{3}} - 12 \times \frac{x^3}{4}\right]_0^2$

$= \left[12x^2 + 4x^3 - 3x^4\right]_0^2$

$= \left[(\cancel{48} + 32 - \cancel{48}) - (0)\right]$

$= 32$ //

(131) $\int (x^3 - 5x + 8)\,dx$

$= \frac{x^4}{4} - \frac{5x^2}{2} + 8x$

$= \frac{x^4 - 10x^2 + 32x}{4}$

$= \frac{x(x^3 - 10x + 32)}{4}$ //

(130) $\int_0^2 12x(x+1)(2-x)\,dx$

$= 12\int_0^2 x(2+x-x^2)\,dx$

$= 12\int_0^2 (2x + x^2 - x^3)\,dx$

$= 12\left[\cancel{2}\frac{x^2}{\cancel{2}} + \frac{x^3}{3} - \frac{x^4}{4}\right]_0^2$

$= 12\left[x^2 + \frac{x^3}{3} - \frac{x^4}{4}\right]_0^2$

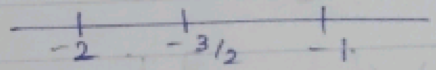
$= 12\left[\left(\cancel{4} + \frac{8}{3} - \cancel{4}\right) - (0)\right]$

$= \overset{4}{\cancel{12}} \times \frac{8}{\cancel{3}} = 32$ //

[illegible]

(132) $\int_{-2}^{-1} |2x+3|\,dx$

$$|2x+3| = \begin{cases} (2x+3); & 2x+3 \geq 0 \\ & x \geq -\frac{3}{2} \\ -(2x+3); & 2x+3 < 0 \\ & x < -\frac{3}{2} \end{cases}$$



$= \int_{-2}^{-3/2} -(2x+3)\,dx + \int_{-3/2}^{-1} (2x+3)\,dx$

$= \int_{-3/2}^{-2} (2x+3)\,dx + \int_{-3/2}^{-1} (2x+3)\,dx$

$= \left[x^2 + 3x\right]_{-3/2}^{-2} + \left[x^2 + 3x\right]_{-3/2}^{-1}$

$= \left[(4-6) - \left(\frac{9}{4} - \frac{9}{2}\right)\right] + \left[(1-3) - \left(\frac{9}{4} - \frac{9}{2}\right)\right]$

$= \left(-2 + \frac{9}{4}\right) + \left(-2 + \frac{9}{4}\right)$

$= \frac{1}{4} + \frac{1}{4}$

$= \frac{1}{2}$ //

(134) $\int_{-2}^{1} |3x+5|\, dx$

$$|3x+5| = \begin{cases} 3x+5 \; ; & 3x+5 \geq 0 \\ & x \geq -5/3 \\ -(3x+5) \; ; & 3x+5 < 0 \\ & x < -5/3 \end{cases}$$

$$\underbrace{-2 \quad -5/3}\quad \underbrace{\quad 1}$$

$x < -5/3$ $\quad$ $x \geq -5/3$

$-(3x+5)$ $\quad$ $(3x+5)$

$$\int_{-2}^{-5/3} -(3x+5)\, dx + \int_{-5/3}^{1} (3x+5)\, dx$$

$$\int_{-5/3}^{-2} (3x+5)\, dx + \int_{-5/3}^{1} (3x+5)\, dx$$

$$\left[\frac{3x^2}{2} + 5x\right]_{-5/3}^{-2} + \left[\frac{3x^2}{2} + 5x\right]_{-5/3}^{1}$$

$$\left[\left(\frac{3\times \cancel{4}^{2}}{\cancel{2}_{1}} - 10\right) - \left(\frac{3}{2}\times\frac{25}{9} - \frac{25}{3}\right)\right] + \left[\left(\frac{3}{2}+5\right) - \left(\frac{3}{2}\times\frac{25}{9} - \frac{25}{3}\right)\right]$$

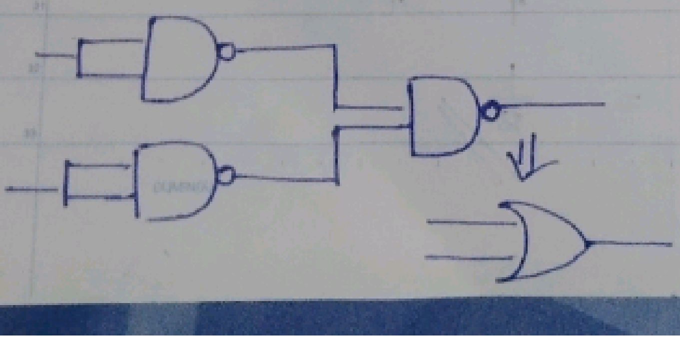
$$\left(-4 + \frac{25}{6}\right) + \left(\frac{13}{2} + \frac{25}{6}\right)$$

$$\frac{5}{2} + \frac{25}{3}$$

$$\frac{15+50}{6}$$

$$\frac{65}{6} \;//$$

(135)



(136) $(a+0)\cdot(b+1) = a$

$(a\cdot 1) + (b\cdot 0) = a$

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(137) $\frac{d}{dx}\left[\frac{x^2-5}{2x+1}\right]$

$$\frac{(2x+1)\,2x - (x^2-5)\,2}{(2x+1)^2}$$

$$\frac{4x^2 + 2x - 2x^2 + 10}{(2x+1)^2}$$

$$\frac{2x^2 + 2x + 10}{(2x+1)^2}$$

$$\frac{2(x^2 + x + 5)}{(2x+1)^2} \;//$$

(138) ~~$(A+B)(\bar{A}+C)(B+C)$~~

~~$(A+B)(B+C)(\bar{A}+C)$~~

~~$B+(A+C)(\bar{A}+C)$~~

(136) $(A+B)(\bar{A}+C)(B+C)$

$(A+B)(B+C)(\bar{A}+C)$

$(AB + AC + BB + BC)(\bar{A}+C)$

$(AB + AC + B + BC)(\bar{A}+C)$

$[AB + A + B\underbrace{(1+C)}_{1}](\bar{A}+C)$

$[AB + A + B](\bar{A}+C)$

$[B\underbrace{(A+1)}_{1} + A](\bar{A}+C)$

$[B + A](\bar{A}+C)$

$(\bar{A}+C)(A+B)$

(139) $\int_{-2}^{-1} (s^2+2s+2) \; ds$

$= \left[\frac{s^3}{3} + \frac{2s^2}{2} + 2s\right]_{-2}^{-1}$

$= \left[\frac{s^3}{3} + s^2 + 2s\right]_{-2}^{-1}$

$= \left(-\frac{1}{3} + 1 - 2\right) - \left(\frac{-8}{3} + \cancel{4} - \cancel{4}\right)$

$= \frac{-4}{3} + \frac{8}{3}$

$= 4/3$ //

(140) Universal Bound Law
(143) $A+1 = 1 \qquad A \cdot 0 = 0$

Identity law

$A+0 = A \qquad A \cdot 1 = A$

Idempotent Law

$A+A = A \qquad A \cdot A = A$

(141) $(A+B)\,(A+C)$

$A \cdot A + A \cdot C + B \cdot A + B \cdot C$ ①

$A + AC + AB + BC$ ②

$A(1+C) + AB + BC$ ③

$A \cdot 1 + AB + BC$ ④

$A\,(1+B) + BC$ ⑤

$A \cdot 1 + BC$ ⑥

$A + BC$ ⑦

Distributive law ①,③,⑤
Idempotent law ②
Universal Bound law ④, ⑥
Identity law ⑦

(142) $(a \cdot b \cdot c \cdot 0) = (a+b+1) \cdot 0$
$a+b+c+1 = (a \cdot b \cdot 0)+1$

Idempotent law

$A+A = A \qquad A \cdot A = A$

Identity law

$A+0 = A \qquad A \cdot 1 = A$

Universal Bound law

$A+1 = 1 \qquad A \cdot 0 = 0$

(145) $f(x) = 2(24-5x)^{1/2}$

$y = 2\,(24-5x)^{1/2}$

$y^2 = \left(2\,(24-5x)^{1/2}\right)^2$

$y^2 = 4\,(24-5x)$

$\frac{y^2}{4} = (24-5x)$

$5x = 24 - \frac{y^2}{4}$

$x = \frac{24 - \frac{y^2}{4}}{5}$

$x = \frac{24}{5} - \frac{y^2}{20} \qquad f^{-1}(x) = \frac{24}{5} - \frac{x^2}{20}$

(149) $(a+0) \cdot (b+1) = a$
$(a \cdot 1) + (b \cdot 0) = a$

(148) $\frac{d}{dx}\left[(2x-3)^4+(x^2-3)^2\right]$

$= 4(2x-3)^3 \cdot 2 + 2(x^2-3)2x$

$= 8(8x^3-36x^2+54x+27)+4x^3-12x$

$= 64x^3-288x^2+432x+216+4x^3-12x$

$= 68x^3-288x^2+420x+216$ //

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(ගුණිතය)

(150) $(\sqrt{x}-3)(x^2-3x)$

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

$= 2x\sqrt{x}-6x-3\sqrt{x}+9+(x-3)x\times\frac{1}{2\sqrt{x}}$

$= \frac{4x\sqrt{x}-12x-6\sqrt{x}+18+x\sqrt{x}-3\sqrt{x}}{2}$

$= \frac{5x\sqrt{x}-12x-9\sqrt{x}+18}{2}$

$= \frac{\sqrt{x}(5x-9)-12x+18}{2}$

---

(151) $\frac{d}{dx}\left[(2\sqrt{x}-3)(x^2-4x)\right]$

$= (2\sqrt{x}-3)\times(2x-4)+(x^2-4x)\times\cancel{2}\cdot\frac{1}{\cancel{2}\sqrt{x}}$

$= (4x\sqrt{x}-8\sqrt{x}-6x+12)+x(x-4)\times\frac{1}{\sqrt{x}}$

$4x\sqrt{x}-8\sqrt{x}-6x+12+x\sqrt{x}-4\sqrt{x}$

$5x\sqrt{x}-12\sqrt{x}-6x+12$

$\sqrt{x}(5x-12)-6x+12$ //

---

52) $(a+0)(b+1)=a$

$(a\cdot 1)+(b\cdot 0)=a$

3) $(a+0+1)(b\cdot c)=b\cdot c\cdot 1$

$(a\cdot 1\cdot 0)+(b+c)=b+c+0$

---

(177) ~~$(x^3-1)^2-x^6+\sqrt{x}-1$~~ (ගුණිතය) 160

~~$2(x^3-1)\cdot 3x^2-6x^5+\frac{1}{2\sqrt{x}}$~~

~~$= 6x^2(x^3-1)-6x^5+\frac{1}{2\sqrt{x}}$~~

~~$= 6x^5\sqrt{x}-6x^2\sqrt{x}-6x^5+1$~~ නැවතට

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(155) $-12x^2+x^{3/2}-3$ ගුණනය

$-24x+\frac{3}{2}x^{1/2}$ //

---

(161)

(156) $(\sqrt{x}-3)(x^2-3x)$ (ගුණිතය)

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

$2x\sqrt{x}-3\sqrt{x}-6x+9+x(x-3)\frac{1}{2\sqrt{x}}$

$\frac{4x\sqrt{x}-6\sqrt{x}-12x+18+x\sqrt{x}-3\sqrt{x}}{2}$

$\frac{5x\sqrt{x}-9\sqrt{x}-12x+18}{2}$

$\frac{\sqrt{x}(5x-9)-12x+18}{2}$ //

---

(157) A function is said to be if and only if f(a) = f(b) implies that a = b for all a & b in the domain of f.

---

(158) $24t^2+\frac{1}{t^{3/2}}-3$

$= 24\cdot 2t+\left(-\frac{3}{2}t^{-3/2-1}\right)-0$

$= 48t-\frac{3}{2}t^{-5/2}$

$= 48t-\frac{3}{2t^{5/2}}$

60) $a \cdot 1 = (a+b+c+1)\, a$
$a+1 = (a \cdot b \cdot c \cdot 0) + a$

---

165)
71)
$$\frac{d}{dx}\left[\frac{x^2-7}{2x+1}\right]$$

$$\frac{(2x+1)(2x) - (x^2-7)2}{(2x+1)^2}$$

$$\frac{4x^2+2x-2x^2+14}{(2x+1)^2}$$

$$\frac{2x^2+2x+14}{(2x+1)^2}$$

$$\frac{2(x^2+2+7)}{(2x+1)^2} //$$

---

166)
$$\frac{d}{dx}\left[\frac{x^2-5}{2x+1}\right]$$

$$= \frac{(2x+1)2x - (x^2-5)2}{(2x+1)^2}$$

$$= \frac{4x^2+2x-2x^2+10}{(2x+1)^2}$$

$$= \frac{2x^2+2x+10}{(2x+1)^2}$$

$$= \frac{2(x^2+2+5)}{(2x+1)^2} //$$

(167) Idempotent law

$A+A = A \qquad A \cdot A = A$

Identity law

$A+0 = A \qquad A \cdot 1 = A$

Absoption law

$A(A+B) = A \qquad A+(A \cdot B) = A$

(168) $ABC + \bar{A}B + AB\bar{C}$

$= ABC + AB\bar{C} + \bar{A}B$

$= AB(C+\bar{C}) + \bar{A}B$

$= AB \cdot 1 + \bar{A}B$

$= AB + \bar{A}B$

$= B(A+\bar{A})$

$= B \cdot 1$

$= B //$

---

(169) $x^{-2} - 3x + 3$

$= -2 \cdot x^{-2-1} - 3x^{1-1} + 0$

$= -2x^{-3} - 3$

$= \frac{-2}{x^3} - 3 //$

---

(170) 100111.1101 → decimal

| 1 | 0 | 0 | 1 | 1 | 1 | . | 1 | 1 | 0 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ | | $2^{-1}$ | $2^{-2}$ | $2^{-3}$ | $2^{-4}$ |
| (32) | (4) | (8) | (4) | (2) | (1) | | (0.5) | (0.25) | (0.125) | (0.0625) |

$= (32 \times 1) + (4 \times 1) + (2 \times 1) + (1 \times 1) +$
$((0.5) \times 1) + ((0.25) \times 1) + (0.0625 \times 1)$

$= (32+4+2+1) + (0.5+0.25+0.0625)$

$= 39.8125_{10} //$

---

(174) $a \cdot 1 = (a+b+c+1) \cdot a$
$a+1 = (a \cdot b \cdot c \cdot 0) + a$

(අතේ [illegible] [illegible]
[illegible] [illegible] [illegible].)

(175) $(\sqrt{x}-3)(x^2-5x)$

$$= (\sqrt{x}-3)(2x-5) + (x^2-5x) \times \frac{1}{2\sqrt{x}}$$

$$= (2x\sqrt{x} - 5\sqrt{x} - 6x + 15) + (x-5)\ x \times \frac{1}{2\sqrt{x}}$$

$$= \frac{(4x\sqrt{x} - 10\sqrt{x} - 12x + 30) + (x-5)\sqrt{x}}{2}$$

$$= \frac{4x\sqrt{x} - 10\sqrt{x} - 12x + 0 + x\sqrt{x} - 5\sqrt{x}}{2}$$

$$= \frac{5x\sqrt{x} - 15\sqrt{x} - 12x + 30}{2}$$

$$= \frac{\sqrt{x}(5x - 15) - 12x + 30}{2} \quad //$$

(182)

$$\frac{d}{dx}\left[\frac{x^2-3}{2x+1}\right]$$

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

$$= \frac{4x^2 + 2x - 2x^2 -}{(2x+1)^2}$$

$$= \frac{2x^2 + 2 + 6}{(2x+1)^2}$$

$$= \frac{2(x^2 + x + 6)}{2} \quad //$$

(188) $\left[\frac{x^2-7}{2x+1}\right]$ අවකලනය

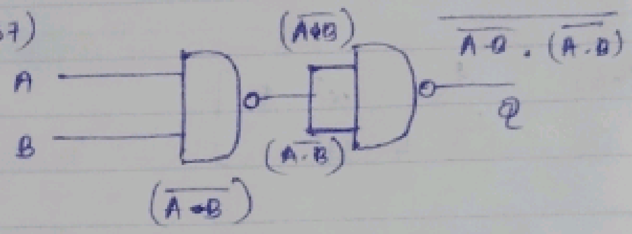
$$= \frac{(2x+1)2x - (x^2-7)2}{(2x+1)^2}$$

$$= \frac{4x^2 + 2x - 2x^2 + 14}{(2x+1)^2}$$

$$= \frac{2x^2 + 2x + 14}{(2x+1)^2}$$

$$= \frac{2(x^2 + x + 7)}{(2x+1)^2} \quad //$$

(187)



$$\overline{\overline{A \cdot B} \cdot \overline{A \cdot B}}$$

$$= \overline{\overline{A \cdot B}} + \overline{\overline{A \cdot B}} \quad \text{(De mogan's law)}$$

$$= (A \cdot B) + (A \cdot B) \quad \text{(law of double)}$$

$$= A \cdot B \quad \text{(Idempotent law)}$$

(මේකම ගැටලුව සෑත් තීරණය
විසඳා ඇත.)

([illegible]) $\int (x^3-5x+8)\,dx$

$= \frac{x^4}{4} - \frac{5x^2}{2} + 8x$

$= \frac{x^4-10x^2+32x}{4}$

$= \frac{x(x^3-10x+32)}{4}$ //

$\int x^3-2x+5 \;\; dx$

$= \frac{x^4}{4} - \frac{\cancel{2}x^2}{\cancel{2}} + 5x$

$= \frac{x^4-4x^2+20x}{4}$

(A.D)

$= \frac{x(x^3-4x+20)}{4}$ //

(210) $x^{-2}-3x+3$

$= -2x^{-2-1} - 3x^{-1-1} + 0$

n's law)

$= -2x^{-3} - 3\underbrace{x^0}_{1}$

uble)

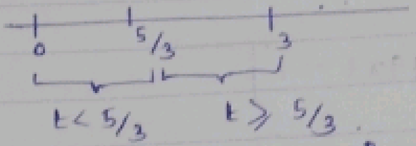
law)

$= -2x^{-3} - 3$

$= \frac{-2}{x^3} - 3$ //

(169) $\int_0^3 |3t-5|\;dx$

$$3t-5 = \begin{cases} (3t-5) & ;\ 3t-5 \geq 0 \\ & \quad 3t \geq 5 \\ & \quad t \geq 5/3 \\ -(3t-5) & ;\ 3t-5 < 0 \\ & \quad 3t < 5 \\ & \quad t < 5/3 \end{cases}$$



$\int_0^{5/3} -(3t-5)\,dt + \int_{5/3}^{3} (3t-5)\,dt$

$\int_{5/3}^{0} (3t-5)\,dt + \int_{5/3}^{3} (3t-5)\,dt$

$= \left[\frac{3t^2}{2} - 5t\right]_{5/3}^{0} + \left[\frac{3t^2}{2} - 5t\right]_{5/3}^{3}$

$= \left[(0-0) - \left(\frac{3}{2}\times\frac{25}{9}\right) - \frac{25}{3}\right] +$

$\left[\left(\frac{27}{2}-15\right) - \left(\frac{3}{2}\times\frac{25}{9} - \frac{25}{3}\right)\right]$

$= \left(-\frac{25}{6} + \frac{25}{3}\right) + \left[-\frac{3}{2} - \frac{25}{6} + \frac{25}{3}\right]$

$= \frac{25}{6} + \frac{(9-25+50)}{6}$

$= 25/6 + 16/6$

$= 41/6$ //

([illegible] [illegible] MC -
1st semester Mid 2021 pdf [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible]

(202) $\int_1^7 x^2 \, dx$

$= \left[\frac{x^3}{3}\right]_1^7$

$= \frac{1}{3}\left[7^3 - 1^3\right]$

$= \frac{1}{3}\left[49 \times 3 - 1\right]$

$= \frac{1}{3}\left[343 - 1\right]$

$= \frac{1}{3} \times 342)$

$= 114$ //

(203) $\frac{d}{dx}\left[\frac{x^2-9}{2x+1}\right]$

$= \frac{(2x+1)2x - (x^2-9)2}{(2x+1)^2}$

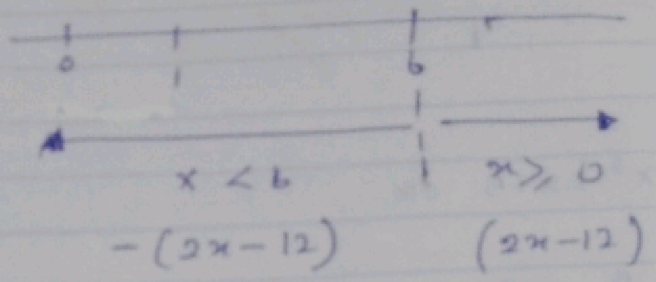
$= \frac{4x^2+2x - 2x^2+18}{(2x+1)^2}$

$= \frac{2x^2+2x+18}{(2x+1)^2}$

$= \frac{2(x^2+2+9)}{(2x+1)^2}$ //

(205) $\int_0^1 |2x-12| \, dx$

$$|2x-12| = \begin{cases} (2x-12) \; ; & 2x-12 \geq 0 \\ & x \geq 6 \\ -(2x-12) \; ; & 2x-12 < 0 \\ & x < 6 \end{cases}$$



$= \int_0^1 -(2x-12) \, dx$

ඍණ ලකුණ
ඉවත් කිරීමට
සීමා මාරු
කළ හැක.

$= \int_1^0 (2x-12) \, dx$

$= \left[\frac{\cancel{2}x^2}{\cancel{2}} - 12x\right]_1^0$

$= \left[x^2 - 12x\right]_1^0$

$= \left[0-(1-12)\right]$

$= -(-11)$

$= 11$ //

$$\int_{-1}^{1} (x-3)^3 \, dx$$

$$= \int_{-1}^{1} \left(x^3 - 9x^2 + 27x - 27\right) dx$$

$$= \left[\frac{x^4}{4} - \frac{\overset{3}{\cancel{9}}x^3}{\cancel{3}} + \frac{27x^2}{2} - 27x\right]_{-1}^{1}$$

$$= \left[\frac{x^4}{4} - 3x^3 + \frac{27}{2} - 27x\right]$$

$$= \left(\frac{1}{4} - 3 + \frac{27}{2} - 27\right) - \left(\frac{1}{4} + 3 + \frac{27}{2} + 27\right)$$

$$= \left(\frac{-11}{4} + \frac{27}{2}\right) - \left(\frac{13}{4} + \frac{81}{2}\right)$$

$$= \frac{-65}{4} - \frac{175}{4}$$

$$= \frac{-240}{4}$$

$$= -60 \; //$$

(212)

$$\begin{array}{r} 10101010 \\ +\ 11001100 \\ \hline 101110110 \\ \hline\hline \end{array}$$

(219) $1999_{10} \longrightarrow$ binary

1999

| 1024 | 512 | 256 | 128 | 64 | 32 | 16 | 8 | 4 | 2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 |

Method I

$$\begin{array}{r} 1999 \\ 1024 \\ \hline 975 \\ 512 \\ \hline 463 \\ 256 \\ \hline 207 \\ 128 \\ \hline 79 \\ 64 \\ \hline 15 \\ 8 \\ \hline 7 \\ 4 \\ \hline 3 \\ 2 \\ \hline 1 \end{array}$$

Method II

$$\begin{array}{r|l} 2 & 1999 \\ 2 & 999 - 1 \\ 2 & 499 - 1 \\ 2 & 249 - 1 \\ 2 & 124 - 1 \\ 2 & 62 - 0 \\ 2 & 31 - 0 \\ 2 & 15 - 1 \\ 2 & 7 - 1 \\ 2 & 3 - 1 \\ 2 & 1 - 1 \\ & 0 - 1 \end{array}$$

$11111001111_2 \; //$

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(225)

$$\begin{array}{r} 1010001 \\ 10 \overline{\smash{)}10100011} \\ 10 \\ \hline 01 \\ 0 \\ \hline 10 \\ 10 \\ \hline 0001 \\ 0 \\ \hline 11 \\ 10 \\ \hline 1 \end{array}$$

(63) ÷ (2) = 81 Remind

$10100011 \div 10 \Rightarrow$

Quotient = 1010001

Remider = 01