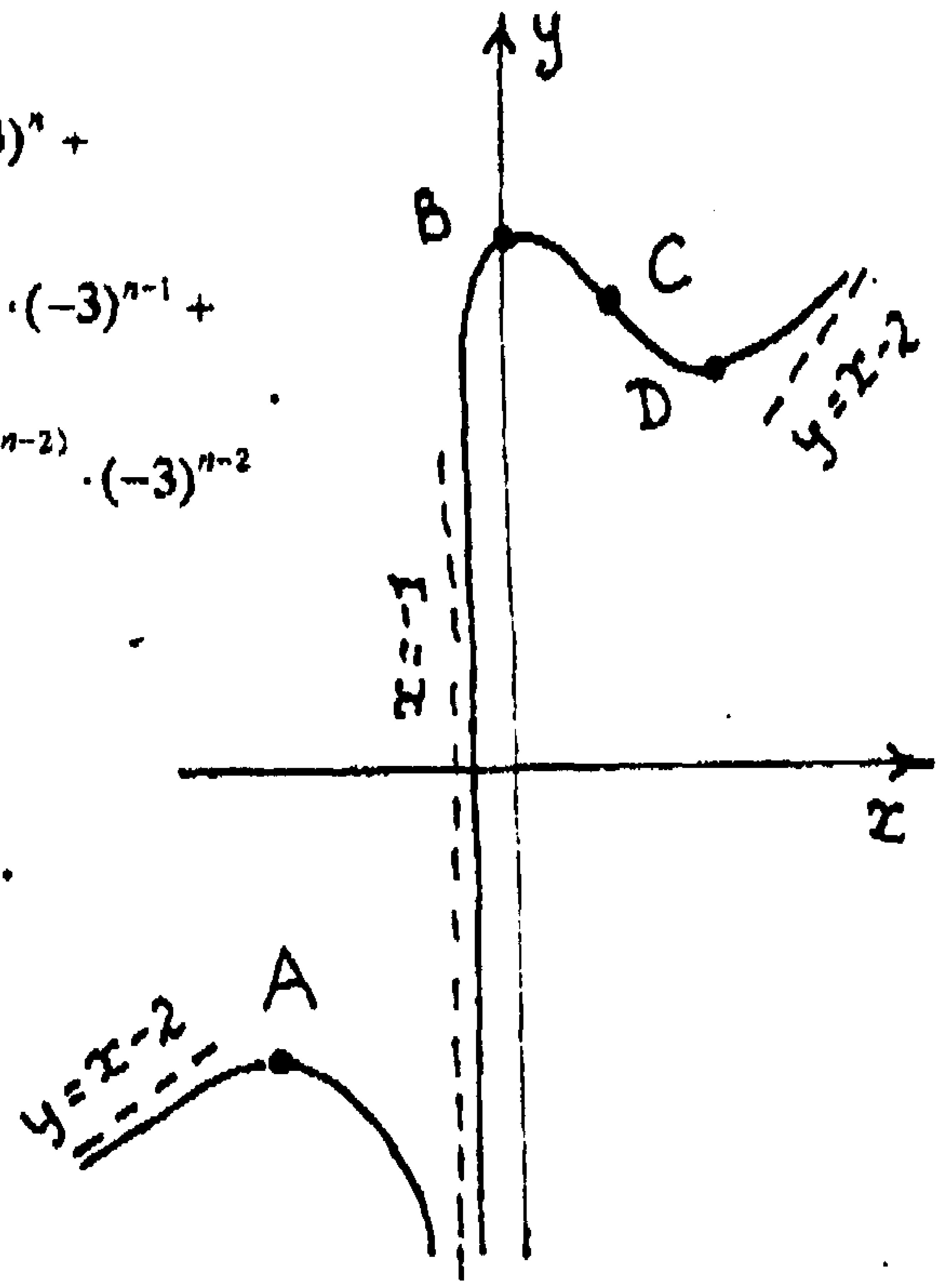
Математический анализ, 1 курс, 1 семестр, 2003-2004, Вариант 31

1. $R_{кр} = \frac{2}{3}\sqrt{2}$.

2. в) $\frac{1}{4}\ln(x^2 - x + 1) + \frac{\sqrt{3}}{2} arctg\frac{2x-1}{\sqrt{3}} + \frac{1}{4}\ln(x^2 + x + 1) + \frac{5}{2\sqrt{3}} arctg\frac{2x+1}{\sqrt{3}} + c$;

2. б) $-\frac{3}{4}x^{4/3}\cos(x^{4/3}) + \frac{3}{4}\sin(x^{4/3}) + c$.



3. $$y^{(n)}(x) = (2x - x^2)\cdot\prod_{k=0}^{n-1}\left(-\frac{3}{2} - k\right)\cdot(2-3x)^{-\frac{3}{2}-n}\cdot(-3)^n +$$
$$+ n\cdot(2-2x)\cdot\prod_{k=0}^{n-2}\left(-\frac{3}{2} - k\right)\cdot(2-3x)^{-\frac{3}{2}-(n-1)}\cdot(-3)^{n-1} +$$
$$+\frac{n(n-1)}{2}\cdot(-2)\cdot\prod_{k=0}^{n-3}\left(-\frac{3}{2} - k\right)\cdot(2-3x)^{-\frac{3}{2}-(n-2)}\cdot(-3)^{n-2}$$

4. $$f(x) = \sum_{k=1}^{n}\frac{1}{k!}C_k(x+1)^k + o\left((x+1)^n\right) \text{ при } x \to -1,$$
$$\text{где } C_k = \frac{e^{-1} - (-1)^k e}{4}\cdot 2^k - \frac{e^{-1} - (-1)^k e}{2}\cdot k.$$

5. а) $y'(x) = \frac{x\cdot(x+4)\cdot(x-1)}{(x+1)^3}$; $y''(x) = \frac{2\cdot(7x-2)}{(x+1)^4}$;

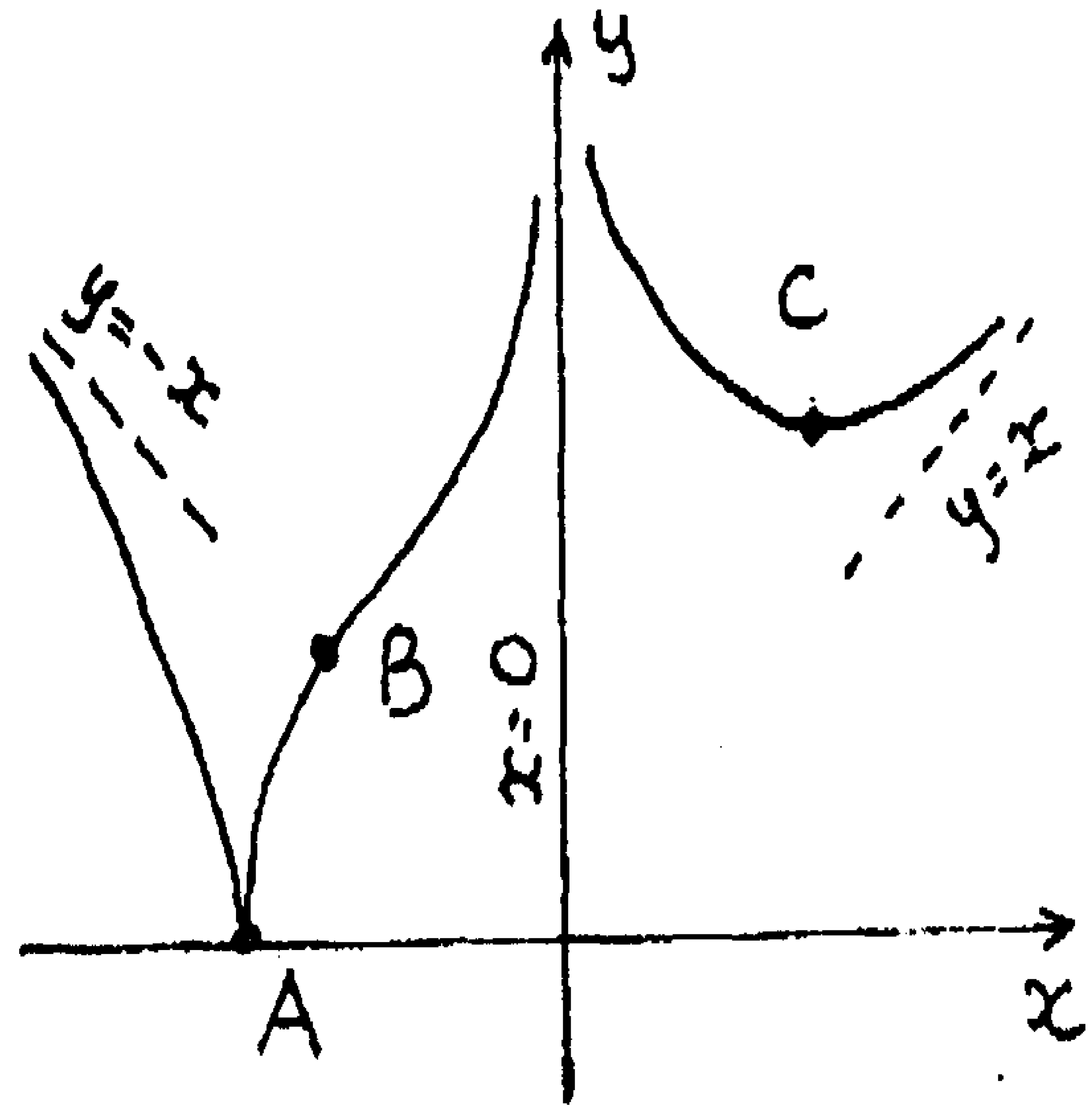
асимптоты: $y = x - 2$ *при* $x \to \pm\infty$,
$x = -1$ *при* $x \to -1 \pm 0$;

A: *максимум*, $x_A = -4$, $y(x_A) = -\frac{26}{3}$, $y'(x_A) = 0$;

B: *максимум*, $x_B = 0$, $y(x_B) = 2$, $y'(x_B) = 0$;

C: *перегиб*, $x_C = \frac{2}{7}$, $y(x_C) = \frac{362}{189}$, $y'(x_C) = -\frac{100}{243}$;

D: *минимум*, $x_D = 1$, $y(x_D) = \frac{7}{4}$, $y'(x_D) = 0$.



5. б) $y'(x) = sign(x^2 + x^{-3})\frac{2x - 3x^{-4}}{2|x^2 + x^{-3}|^{1/2}}$;

$$y''(x) = \frac{5(8 + 3x^{-5})}{4x^3|x^2 + x^{-3}|^{3/2}};$$

асимптоты: $y = \pm x$ *при* $x \to \pm\infty$;

A: *минимум*, $x_A = -1$, $y(x_A) = 0$, $y'(x_A \pm 0) = \pm\infty$;

B: *перегиб*, $x_B = -\left(\frac{3}{8}\right)^{1/5}$, $y(x_B) = \left(\frac{3}{8}\right)^{1/5}\sqrt{\frac{5}{3}}$, $y'(x_B) = \sqrt{15}$;

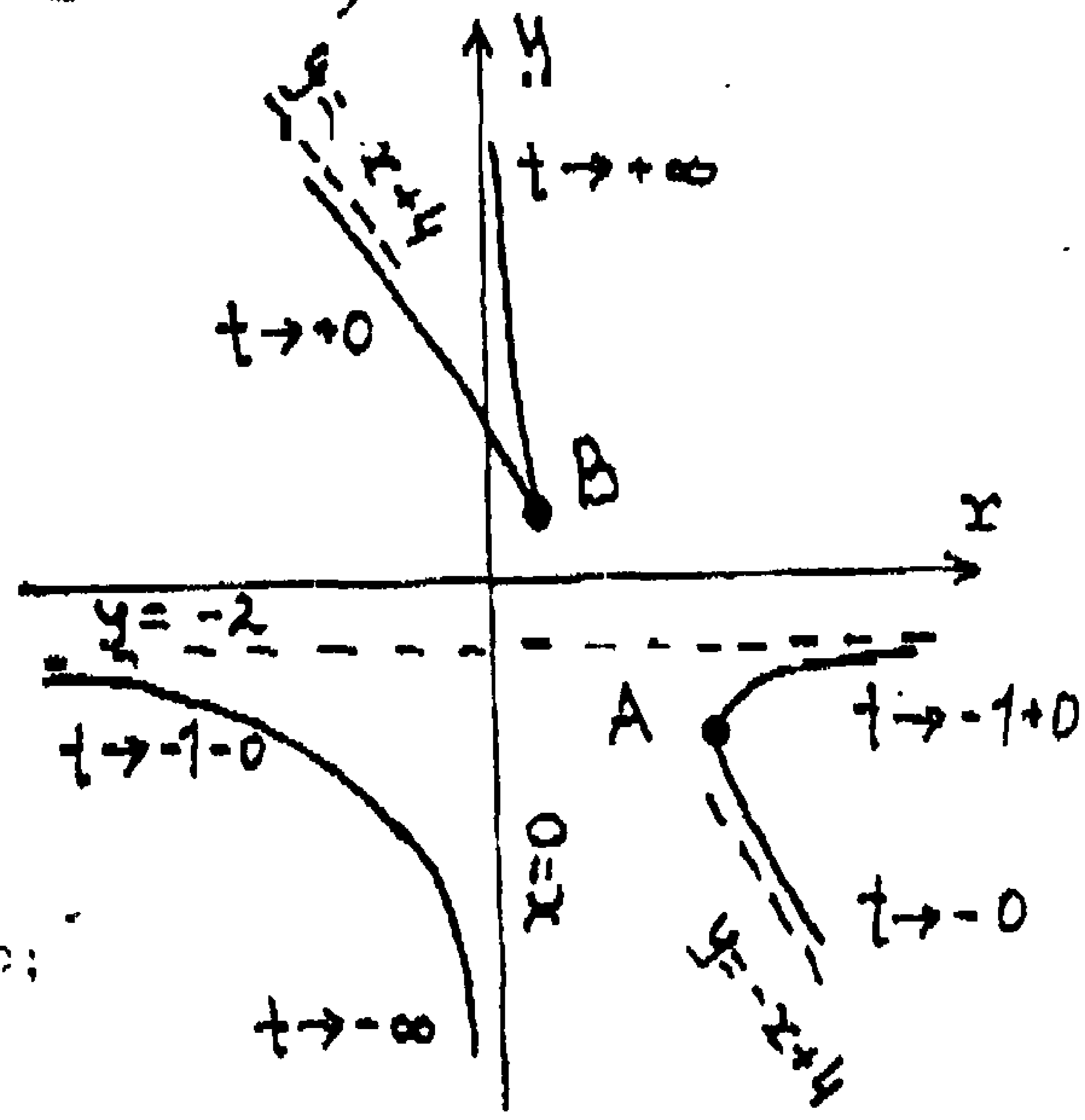
C: *минимум*, $x_C = \left(\frac{3}{2}\right)^{1/5}$, $y(x_C) = \left(\frac{3}{2}\right)^{1/5}\sqrt{\frac{5}{3}}$, $y'(x_C) = 0$.

Вар 31

6. *При* $x \to 0$:

$$\frac{\left(-x - \frac{1}{6}x^3 + o(x^3)\right) + \frac{1}{2}\left(2x + 2x^3 + o(x^3)\right)}{\left(1 + x + \frac{1}{2}x^2 - \frac{1}{3}x^3 + o(x^3)\right) - \left(x + x^2 + x^3 + o(x^3)\right) - \left(1 - \frac{1}{2}x^2 + o(x^3)\right)} \to -\frac{5}{8}.$$

7. $$\left(\frac{2x + \frac{26}{3}x^3 + o(x^3)}{2x - \frac{4}{3}x^3 + o(x^3)}\right)^{\frac{x}{\text{[illegible]}}} \to e^{-40} \quad \text{при } x \to +0.$$



8. $y'_x(t) = -\dfrac{(t+1)^3}{3t+1}$; $y''_{xx}(t) - 6\dfrac{t^3(t+1)^4}{(t-1)(3t+1)^3}$;

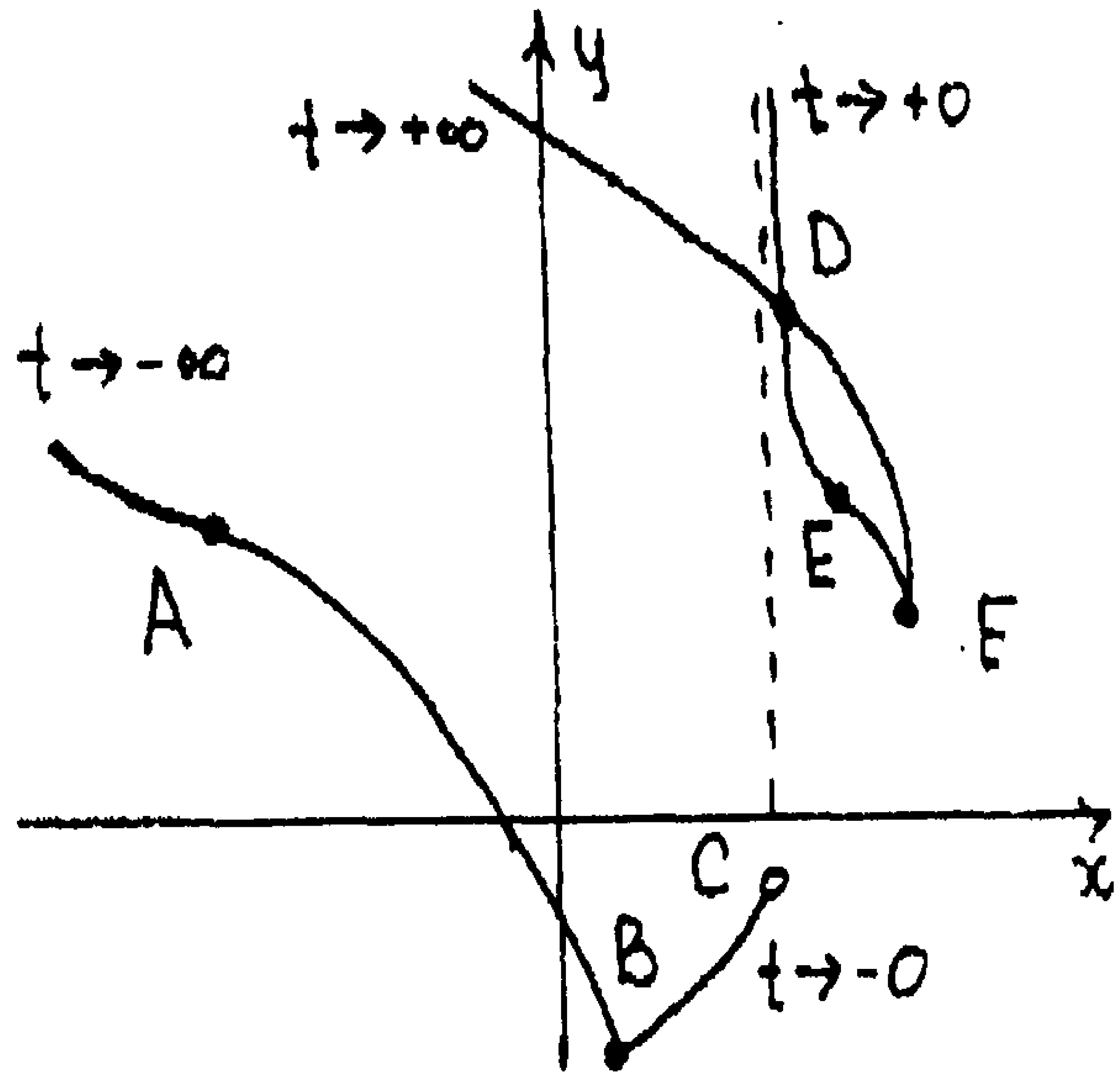
асимптоты: $x = 0$ *при* $t \to \pm\infty$;

$y = -2$ *при* $t \to -1 \pm 0$;

$y = -x + 4$ *при* $t \to \pm 0$;

A: $t_A = -\dfrac{1}{3}$, $x(t_A) = 9$, $y(t_A) = -\dfrac{10}{3}$, $y'_x(t_A \pm 0) = \mp\infty$;

B: *возврат*, $t_B = 1$, $x(t_B) = 1$, $y(t_B) = 2$, $y'_x(t_B) = -2$.



9. $$y'_x(t) = \begin{cases} \dfrac{2t^3 - 3}{2t^2(1-t)}, & t \in \left(-\infty; -\dfrac{3}{4}\right) \cup (0;1) \\ \dfrac{t+2}{1-t}, & t \in \left(-\dfrac{3}{4}; 0\right) \cup (1; +\infty) \end{cases};$$

$$y''_{xx}(t) = \begin{cases} \dfrac{2t^3 - 9t + 6}{4t^3(1-t)^3}, & t \in \left(-\infty; -\dfrac{3}{4}\right) \cup (0;1) \\ \dfrac{3}{2(1-t)^3}, & t \in \left(-\dfrac{3}{4}; 0\right) \cup (1; +\infty) \end{cases};$$

асимптоты: $x = 3$ *при* $t \to +0$;

A: *перегиб*, $t_A < t_B$, $x(t_A) < 0$, $y(t_A) = \dfrac{9}{2}$, $y'_x(t_A) < 0$;

B: $t_B = -\dfrac{3}{4}$, $x(t_B) = \dfrac{15}{16}$, $y(t_B) = -\dfrac{55}{16}$, $y'_x(t_B - 0) = -\dfrac{41}{21}$, $y'_x(t_B + 0) = \dfrac{5}{7}$;

C: $t_C = 0$, $x(t_C - 0) = 3$, $y(t_C - 0) = -1$, $y'_x(t_C - 0) = 2$;

D: *самопересечение*, $t_D = \dfrac{3}{8}$, $\tau_D = \dfrac{13}{8}$, $x(t_D) = x(\tau_D) = \dfrac{231}{64}$,

$y(t_D) = y(\tau_D) = \dfrac{521}{64}$, $y'_x(t_D) = -\dfrac{247}{15}$, $y'_x(\tau_D) = -\dfrac{29}{5}$;

E: *перегиб*, $t_E \in \left(\dfrac{3}{8}; 1\right)$, $x(t_E) \in \left(\dfrac{231}{64}; 4\right)$, $y(t_E) = \dfrac{9}{2}$, $y'_x(t_E) < 0$;

F: *возврат*, $t_F = 1$, $x(t_F) = 4$, $y(t_F) = 4$, $y'_x(t_F \pm 0) = -\infty$.

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1. $R_{кр} = 1$.

2. а) $\frac{1}{4}\ln(x^2 - x + 2) - \frac{5}{2\sqrt{7}} arctg\frac{2x-1}{\sqrt{7}} + \frac{1}{4}\ln(x^2 + x + 2) + \frac{1}{2\sqrt{7}} arctg\frac{2x+1}{\sqrt{7}} + c$;

2. б) $\frac{3}{5}x^{5/3} sh(x^{5/3}) - \frac{3}{5} ch(x^{5/3}) + c$.

3. $$y^{(n)}(x) = (3x - x^2)\cdot\prod_{k=0}^{n-1}\left(-\frac{2}{3}-k\right)\cdot(3-2x)^{-\frac{2}{3}-n}\cdot(-2)^n +$$

$$+ n\cdot(3-2x)\cdot\prod_{k=0}^{n-2}\left(-\frac{2}{3}-k\right)\cdot(3-2x)^{-\frac{2}{3}-(n-1)}\cdot(-2)^{n-1} +$$

$$+\frac{n(n-1)}{2}\cdot(-2)\cdot\prod_{k=0}^{n-3}\left(-\frac{2}{3}-k\right)\cdot(2-2x)^{-\frac{2}{3}-(n-2)}\cdot(-2)^{n-2}$$

4. $$f(x) = ch1 + \sum_{k=1}^{n}\frac{1}{k!}C_k(x-1)^k + o\left((x-1)^n\right) \quad при \quad x \to 1,$$

$$где \quad C_k = \frac{e + (-1)^k e^{-1}}{4}\cdot 2^k - \frac{e - (-1)^k e^{-1}}{2}\cdot k.$$

5. а) $y'(x) = \frac{(x^2-2)(x^2-5)}{(x^2+1)^2}$; $\quad y''(x) = \frac{18x\cdot(x^2-3)}{(x^2+1)^3}$;

асимптоты: $y = x$ при $x \to \pm\infty$;

A: максимум, $x_A = -\sqrt{5}$, $y(x_A) = -\frac{5}{2}\sqrt{5}$, $y'(x_A) = 0$;

B: перегиб, $x_B = -\sqrt{3}$, $y(x_B) = -\frac{13}{4}\sqrt{3}$, $y'(x_B) = -\frac{1}{8}$;

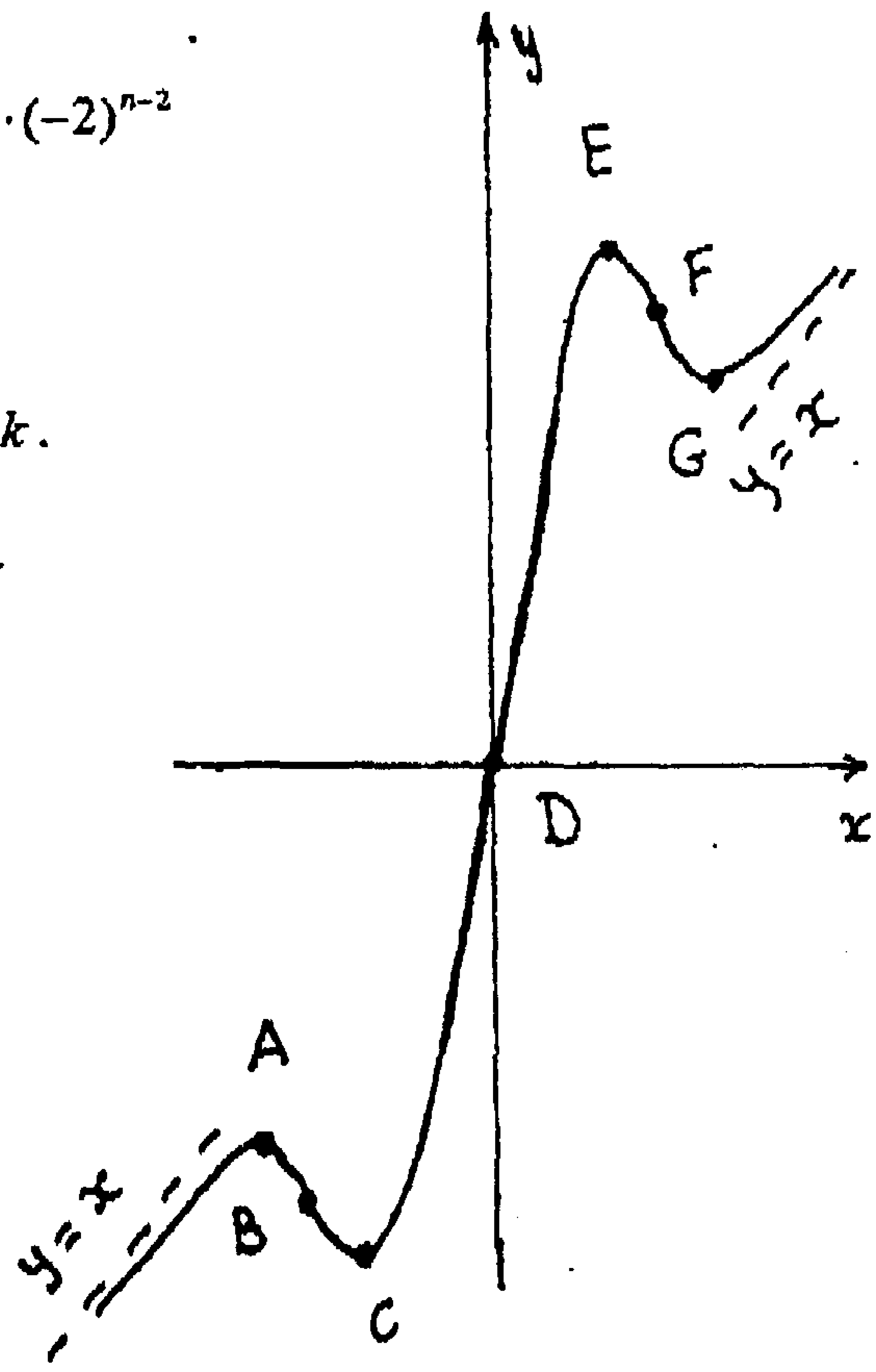
C: минимум, $x_C = -\sqrt{2}$, $y(x_C) = -4\sqrt{2}$, $y'(x_C) = 0$;

D: перегиб, $x_D = 0$, $y(x_D) = 0$, $y'(x_D) = 10$;

E: максимум, $x_E = \sqrt{2}$, $y(x_E) = 4\sqrt{2}$, $y'(x_E) = 0$;

F: перегиб, $x_F = \sqrt{3}$, $y(x_F) = \frac{13}{4}\sqrt{3}$, $y'(x_F) = -\frac{1}{8}$;

G: минимум, $x_G = \sqrt{5}$, $y(x_G) = \frac{5}{2}\sqrt{5}$, $y'(x_G) = 0$.



5. б) $y'(x) = sign(x^3 + x^{-2})\frac{3x^2 - 2x^{-3}}{3|x^3 + x^{-2}|^{2/3}}$;

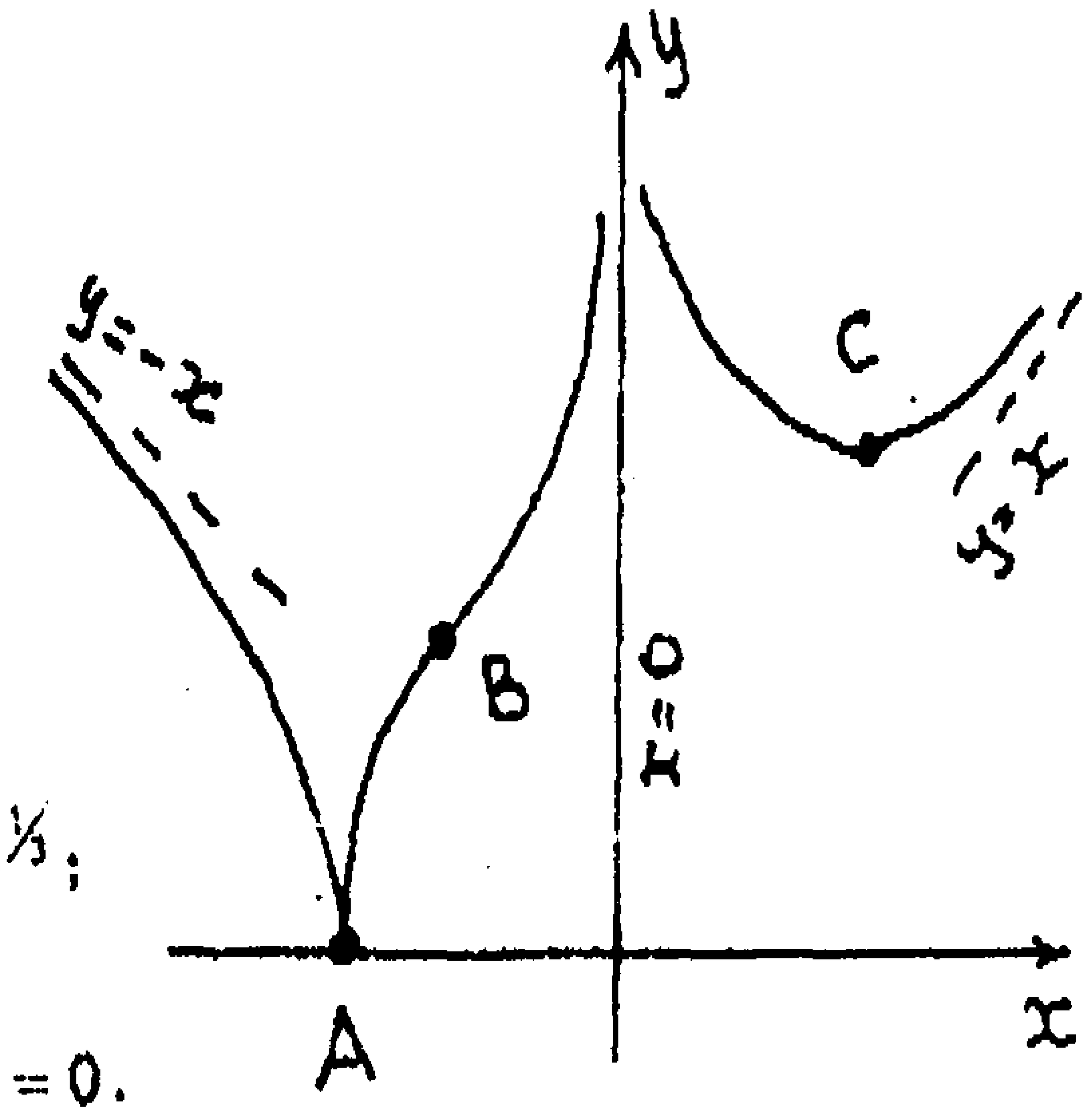
$y''(x) = -\frac{10(6 + x^{-5})}{9x|x^3 + x^{-2}|^{5/3}}$;

асимптоты: $y = \pm x$ при $x \to \pm\infty$;

A: $x_A = -1$, $y(x_A) = 0$, $y'(x_A \pm 0) = \pm\infty$;

B: перегиб, $x_A = -\left(\frac{1}{6}\right)^{1/5}$, $y(x_B) = \left(\frac{1}{6}\right)^{1/5} 5^{1/3}$, $y'(x_A) = 5^{1/3}$;

C: минимум, $x_C = \left(\frac{2}{3}\right)^{1/5}$, $y(x_C) = \left(\frac{2}{3}\right)^{1/5}\left(\frac{5}{2}\right)^{1/3}$, $y'(x_C) = 0$.



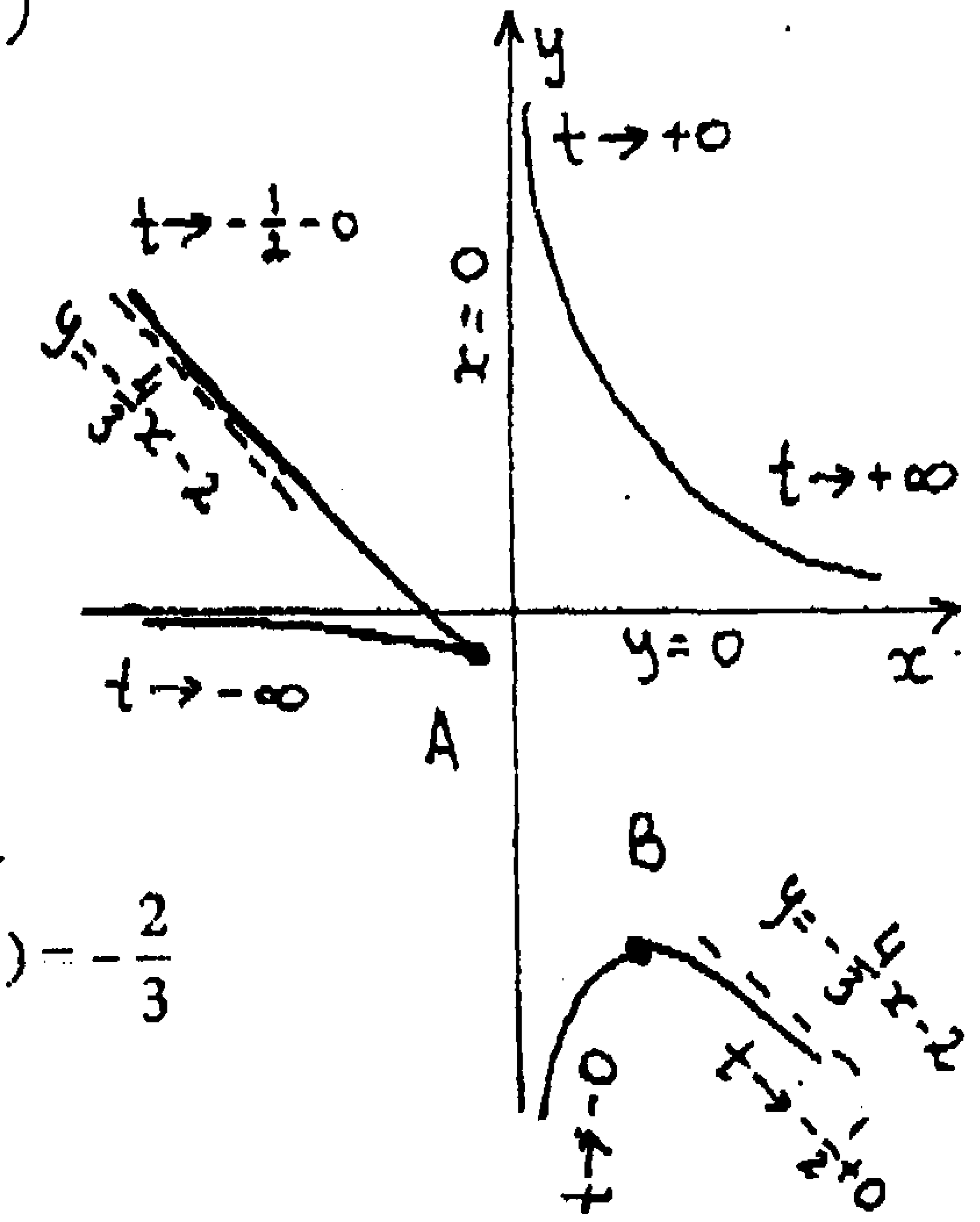
Вар 3:2

Вар. 32

6.

$$\frac{\left(1+x-\frac{1}{2}x^2-\frac{2}{3}x^3+o(x^3)\right)-\left(x+\frac{5}{6}x^3+o(x^3)\right)-\left(1-\frac{1}{2}x^2+o(x^3)\right)}{\left(1+x+\frac{1}{2}x^2-\frac{1}{6}x^3+o(x^3)\right)+\left(-x-\frac{1}{2}x^2-\frac{1}{6}x^3+o(x^3)\right)-1}\to\frac{9}{2}\ \text{при}\ x\to+0.$$

7. $$\left(\frac{x+\frac{23}{24}x^3+o(x^3)}{x+\frac{1}{3}x^3+o(x^3)}\right)^{\frac{x^2}{\frac{1}{4}x^4+o(x^4)}}\to e^{\frac{5}{2}}\ \text{при}\ x\to 0.$$



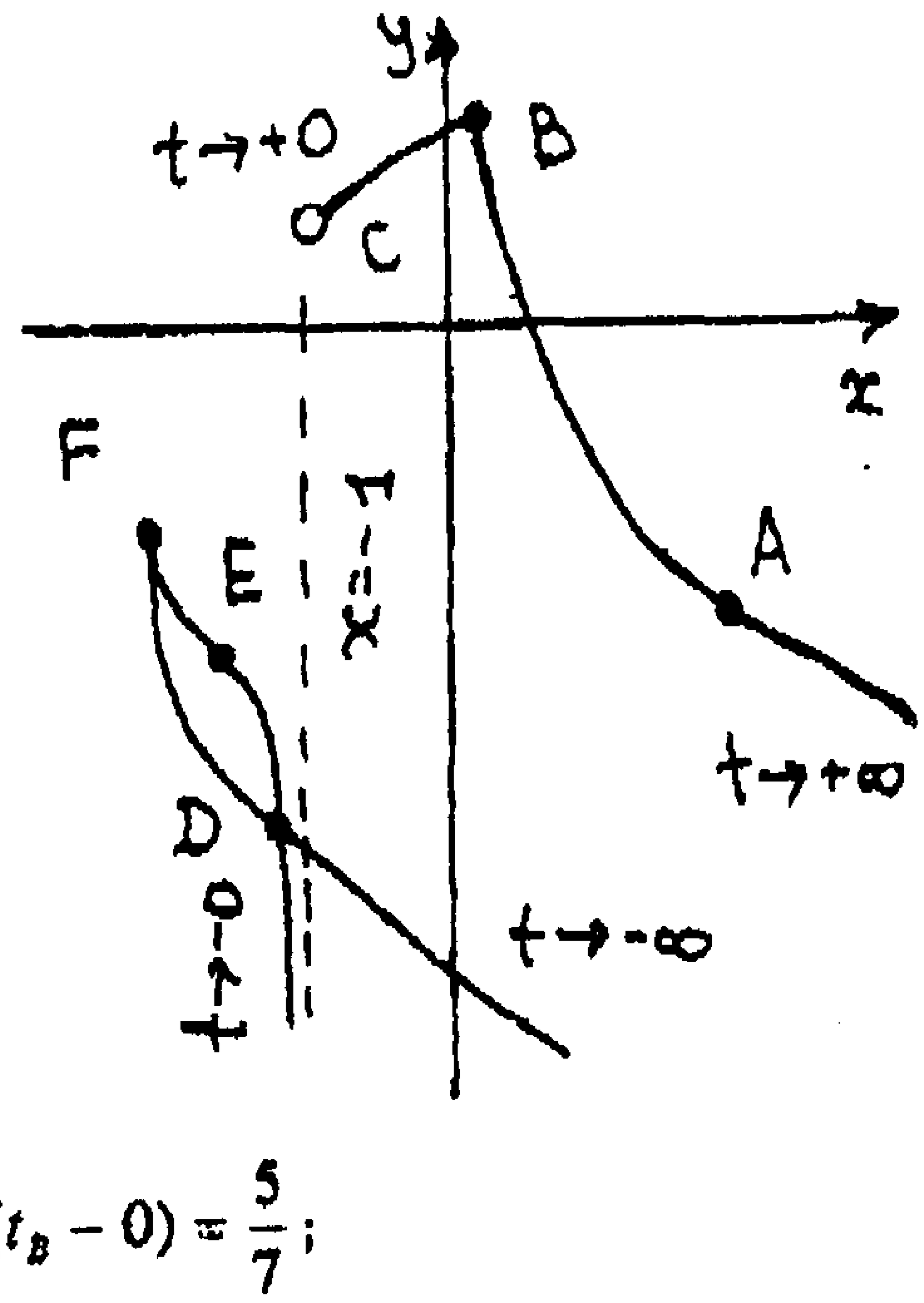
8. $y'_x(t)=-\frac{3t+1}{3t^3}$; $\quad y''_{xx}(t)=\frac{(2t+1)^3}{2t^5(t+1)}$;

асимптоты: $y=0$ *при* $t\to+\infty$, $x=0$ *при* $t\to\pm0$,

$y=-\frac{4}{3}x-2$ *при* $t\to-\frac{1}{2}\mp0$;

A: *возврат*, $t_A=-1$, $x(t_A)=1$, $y(t_A)=-\frac{1}{3}$, $y'_x(t_A)=-\frac{2}{3}$

B: $t_B=-\frac{1}{3}$, $x(t_B)=\frac{1}{3}$, $y(t_B)=-3$, $y'_x(t_B)=0$.



9. $$y'_x(t)=\begin{cases}\frac{2-t}{t+1}, & t\in(-\infty;-1)\cup\left(0;\frac{3}{4}\right)\\ -\frac{3+2t^3}{2t^2(t+1)}, & t\in(-1;0)\cup\left(\frac{3}{4};+\infty\right)\end{cases};$$

$$y''_{xx}(t)=\begin{cases}-\frac{3}{2(t+1)^3}, & t\in(-\infty;-1)\cup\left(0;\frac{3}{4}\right)\\ -\frac{2t^3-9t-6}{4t^3(t+1)^3}, & t\in(-1;0)\cup\left(\frac{3}{4};+\infty\right)\end{cases};$$

асимптоты: $x=-1$ *при* $t\to-0$;

A: *перегиб*, $t_A>t_B$, $x(t_A)>x(t_B)$, $y(t_A)=-\frac{9}{2}$, $y'_x(t_A)<0$;

B: $t_B=\frac{3}{4}$, $x(t_B)=\frac{17}{16}$, $y(t_B)=\frac{55}{16}$, $y'_x(t_B+0)=-\frac{41}{21}$, $y'_x(t_B-0)=\frac{5}{7}$;

C: $t_C=0$, $x(t_C-0)=-1$, $y(t_C-0)=1$, $y'_x(t_C-0)=2$;

D: *самопересечение*, $t_D=-\frac{3}{8}$, $\tau_D=-\frac{13}{8}$, $x(t_D)=x(\tau_D)=-\frac{103}{64}$,

$y(t_D)=y(\tau_D)=-\frac{521}{64}$, $y'_x(t_D)=-\frac{247}{15}$, $y'_x(\tau_D)=-\frac{29}{5}$;

E: *перегиб*, $t_E\in\left(-1;-\frac{3}{8}\right)$, $x(t_E)\in\left(-2;-\frac{103}{64}\right)$, $y(t_E)=-\frac{9}{2}$, $y'_x(t_E)<0$;

F: *возврат*, $t_F=-1$, $x(t_F)=-2$, $y(t_F)=-4$, $y'_x(t_F\pm0)=-\infty$

$y''(5)$, ас.(8)

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1. $R_{тр} = 6\sqrt{2}$.

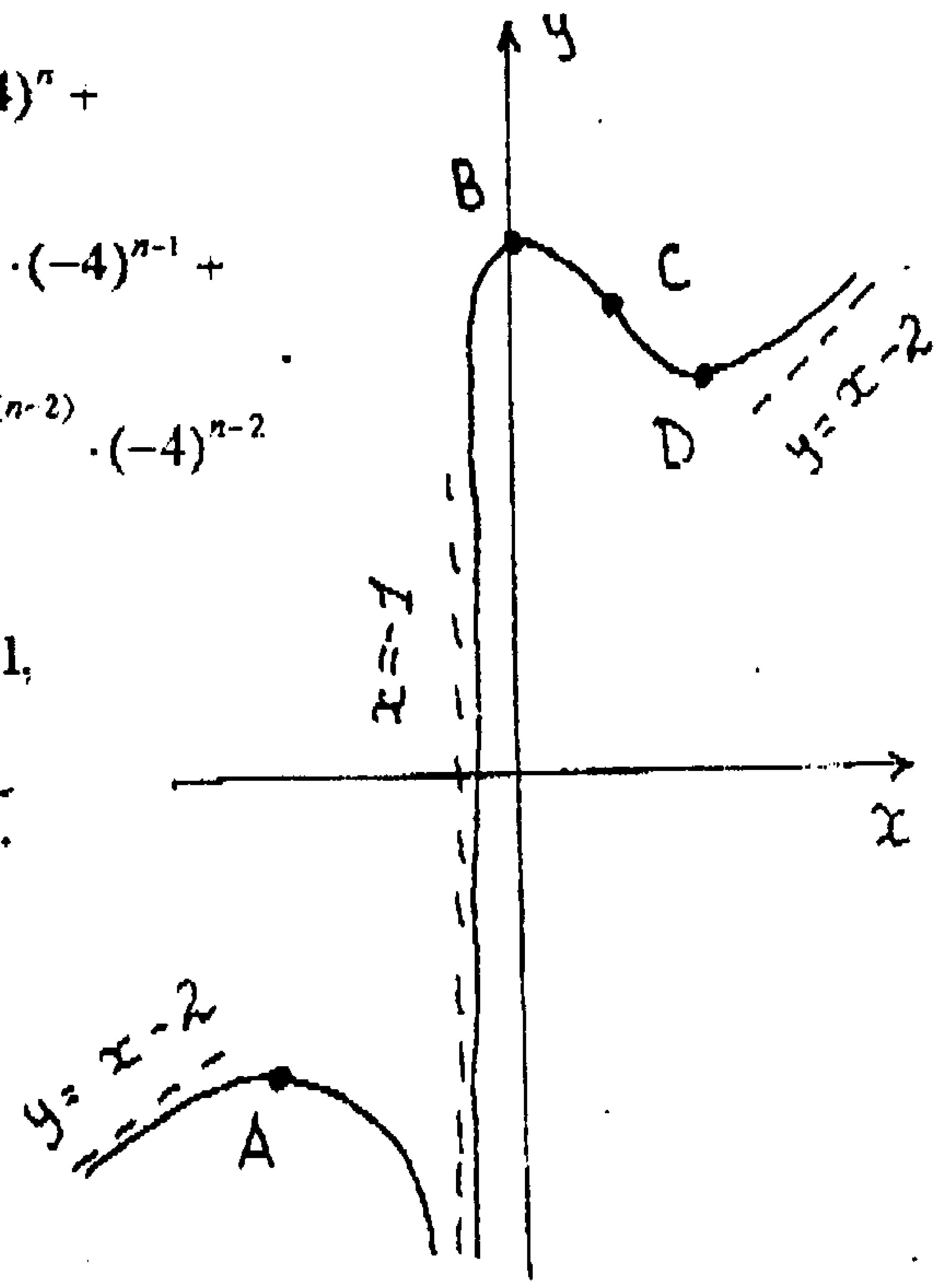
2. а) $\frac{1}{4}\ln(x^2 - x + 4) - \frac{5}{2\sqrt{15}} arctg\frac{2x-1}{\sqrt{15}} + \frac{1}{4}\ln(x^2 + x + 4) + \frac{9}{2\sqrt{15}} arctg\frac{2x+1}{\sqrt{15}} + c$;

2. б) $\frac{5}{6}x^{6/5}ch(x^{6/5}) - \frac{5}{6}sh(x^{6/5}) + c$.

3. $y^{(n)}(x) = (3x - x^2)\cdot\prod_{k=0}^{n-1}(-\frac{3}{4}-k)\cdot(3-4x)^{-\frac{3}{4}-n}\cdot(-4)^n +$

$+ n\cdot(3-2x)\cdot\prod_{k=0}^{n-2}(-\frac{3}{4}-k)\cdot(3-4x)^{-\frac{3}{4}-(n-1)}\cdot(-4)^{n-1} +$

$+ \frac{n(n-1)}{2}\cdot(-2)\cdot\prod_{k=0}^{n-3}(-\frac{3}{4}-k)\cdot(3-4x)^{-\frac{3}{4}-(n-2)}\cdot(-4)^{n-2}$



4. $f(x) = sh1 + \sum_{k=1}^{n}\frac{1}{k!}C_k(x-1)^k + o((x-1)^n)$ при $x \to 1$,

где $C_k = \frac{e-(-1)^k e^{-1}}{4}\cdot 2^k + \frac{e+(-1)^k e^{-1}}{2}\cdot k$.

5. а) $y'(x) = \frac{x\cdot(x+6)\cdot(x-3)}{(x+1)^3}$; $y''(x) = \frac{6\cdot(7x-3)}{(x+1)^4}$;

асимптоты: $y = x - 2$ при $x \to \pm\infty$,

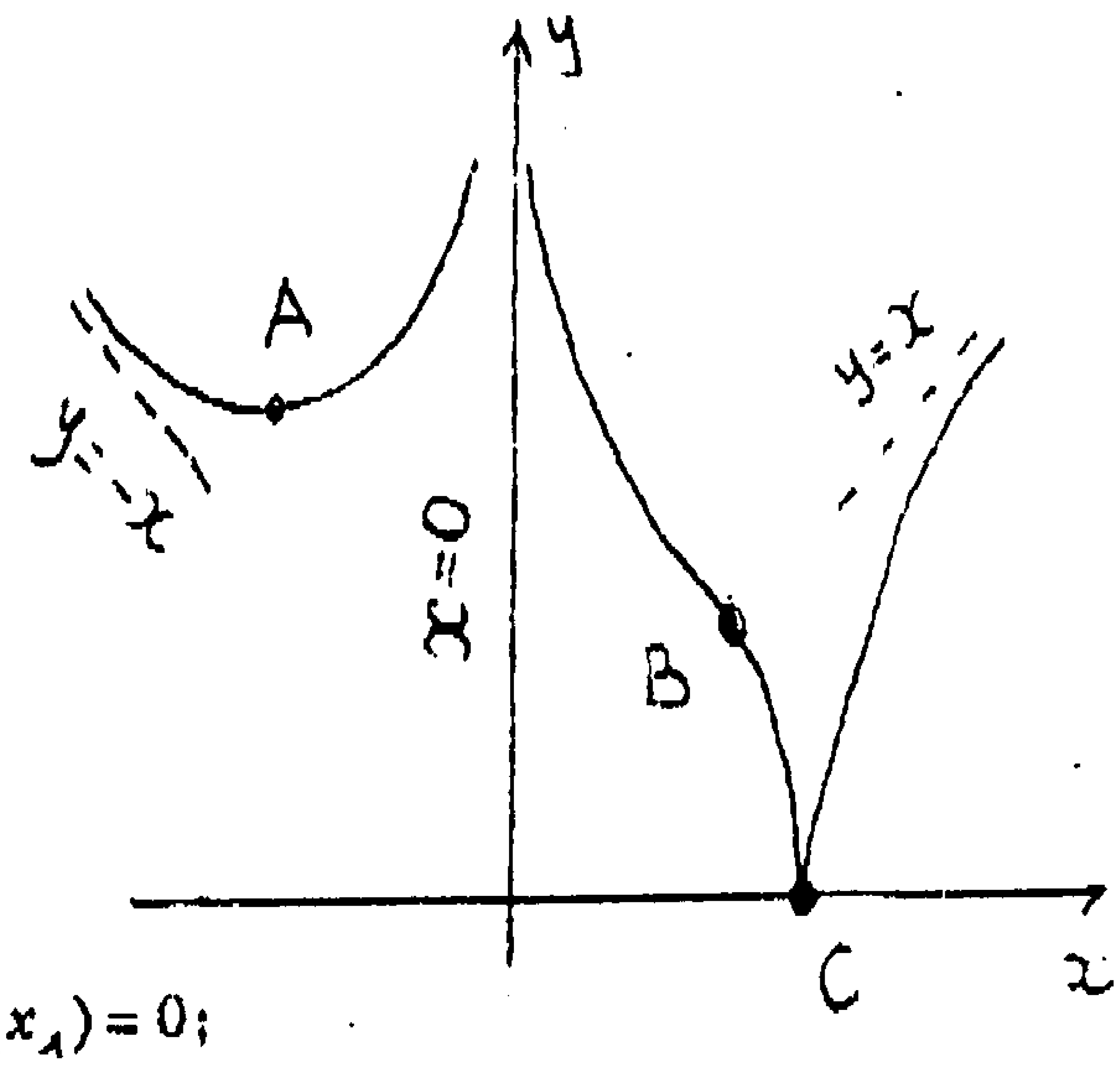
$x = -1$ при $x \to -1 \pm 0$;

A: максимум, $x_A = -6$, $y(x_A) = -\frac{63}{5}$, $y'(x_A) = 0$;

B: максимум, $x_B = 0$, $y(x_B) = 9$, $y'(x_B) = 0$;

C: перегиб, $x_C = \frac{3}{7}$, $y(x_C) = \frac{288}{35}$, $y'(x_C) = -2{,}43$;

D: минимум, $x_D = 3$, $y(x_D) = \frac{45}{8}$, $y'(x_D) = 0$.



5. б) $y'(x) = sign(x^2 - x^{-5})\frac{2x + 5x^{-6}}{2|x^2 - x^{-5}|^{1/2}}$;

$y''(x) = \frac{7(-12x^7 + 5)}{4x^{12}|x^2 - x^{-5}|^{3/2}}$;

асимптоты: $y = \pm x$ при $x \to \pm\infty$;

A: минимум, $x_A = -\left(\frac{5}{2}\right)^{1/7}$, $y(x_A) = \left(\frac{5}{2}\right)^{1/7}\sqrt{\frac{7}{5}}$, $y'(x_A) = 0$;

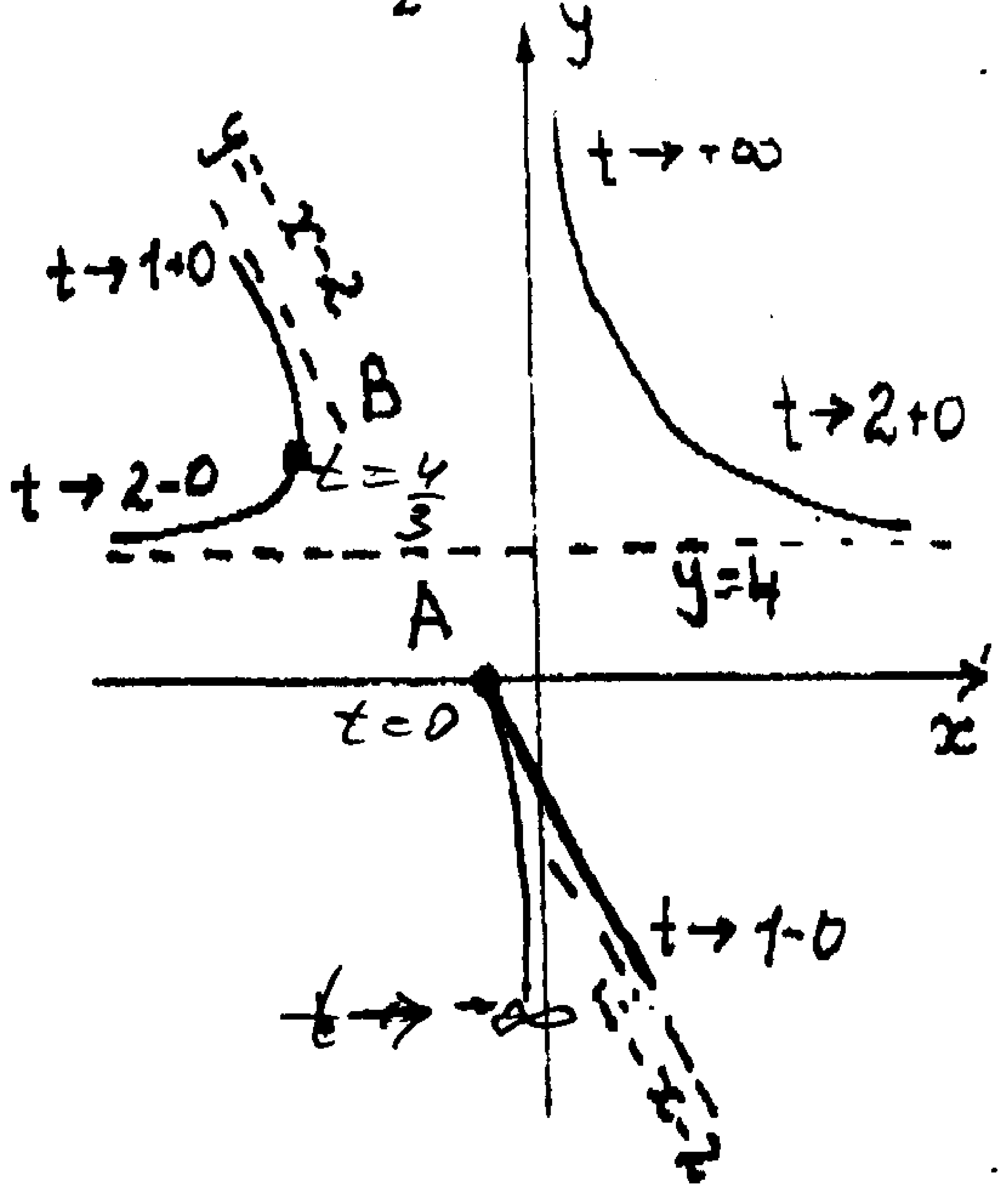
B: перегиб, $x_B = -\left(\frac{5}{12}\right)^{1/7}$, $y(x_B) = \left(\frac{5}{12}\right)^{1/7}\sqrt{\frac{7}{5}}$, $y'(x_A) = -\frac{17}{2}\left(\frac{5}{12}\right)^{1/7}\sqrt{\frac{5}{7}}$;

C: минимум, $x_C = 1$, $y(x_C) = 0$, $y'(x_C \pm 0) = \pm\infty$.

Вар 33

6. *При* $t \to 0$:

$$\frac{\left(1+x-\frac{1}{2}x^2+\frac{1}{6}x^3+o(x^3)\right)-\left(1-\frac{1}{2}x^3+o(x^3)\right)-\frac{1}{2}\left(2x-x^3+o(x^3)\right)}{\left(x+\frac{5}{6}x^3+o(x^3)\right)-\left(x-\frac{1}{2}x^3+o(x^3)\right)} \to \frac{1}{2}.$$



7. $$\left(\frac{2x+3x^3+o(x^3)}{2x+\frac{4}{3}x^3+o(x^3)}\right)^{\frac{x}{\frac{1}{8}x^3+o(x^3)}} \to e^{20/3} \quad \textit{при } t \to +0.$$

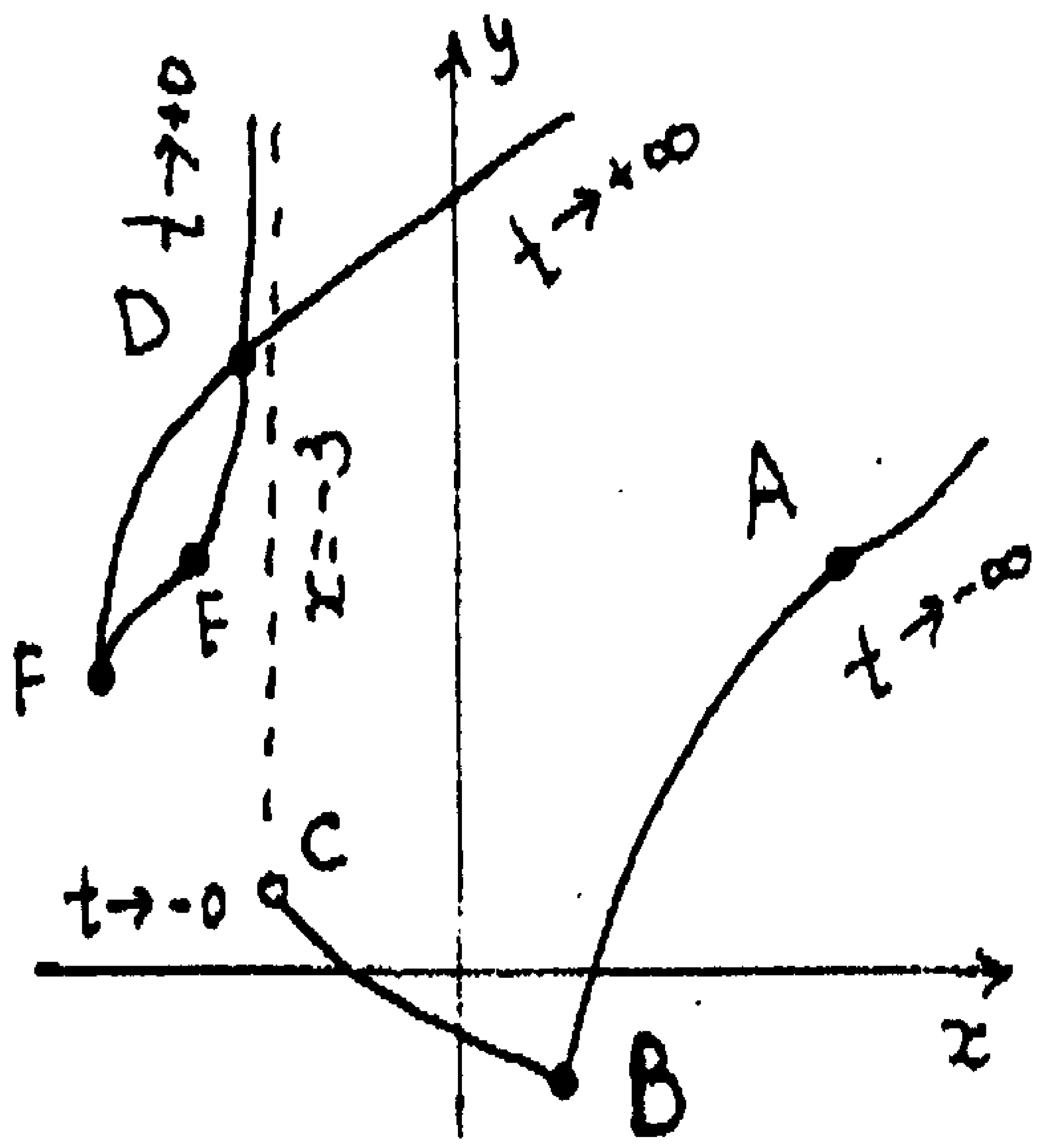
8. $y'_x(t)=\dfrac{(t-2)^3}{(-3t+4)}$; $y''_{xx}=-6\dfrac{(t-2)^4(t-1)^3}{(-3t+4)^3 t}$;

асимптоты: $x=0$ *при* $t \to \pm\infty$;

$y=-x-2$ *при* $t \to 1\pm 0$;

A: *возврат*, $t_A=0$, $x(t_A)=-1$, $y(t_A)=0$, $y'_x(t_A)=-2$;

B: $t_B=\dfrac{4}{3}$, $x(t_B)=-9$, $y(t_B)=\dfrac{16}{3}$, $y'_x(t_B\pm 0)=\pm\infty$.



9. $$y'_x(t)=\begin{cases}\dfrac{t^3-2}{t^2(t-1)}, & t\in\left(-\infty;-\frac{4}{3}\right)\cup(0;1)\\ \dfrac{2t+3}{2(t-1)}, & t\in\left(-\frac{4}{3};0\right)\cup(1;+\infty)\end{cases};$$

$$y''_{xx}(t)=\begin{cases}-\dfrac{(t-2)\cdot(t^2+2t-2)}{2t^3(t-1)^3}, & t\in\left(-\infty;-\frac{4}{3}\right)\cup(0;1)\\ -\dfrac{5}{2(t-1)^3}, & t\in\left(-\frac{4}{3};0\right)\cup(1;+\infty)\end{cases};$$

асимптоты: $x=-3$ *при* $t \to +0$;

A: *перегиб*, $t_A=-1-\sqrt{3}$, $x(t_A)=3+4\sqrt{3}$, $y(t_A)=6$, $y'_x(t_A)=6-3\sqrt{3}$;

B: $t_B=-\dfrac{4}{3}$, $x(t_B)=\dfrac{13}{9}$, $y(t_B)=-\dfrac{11}{9}$, $y'_x(t_B-0)=\dfrac{59}{56}$, $y'_x(t_B+0)=-\dfrac{1}{14}$;

C: $t_C=0$, $x(t_C-0)=-3$, $y(t_C-0)=1$, $y'_x(t_C-0)=-\dfrac{3}{2}$;

D: *самопересечение*, $t_D=\dfrac{4}{7}$, $\tau_D=\dfrac{10}{7}$, $x(t_D)=x(\tau_D)=-\dfrac{187}{49}$,

$y(t_D)=y(\tau_D)=\dfrac{359}{49}$, $y'_x(t_D)=\dfrac{311}{24}$, $y'_x(\tau_D)=\dfrac{41}{6}$;

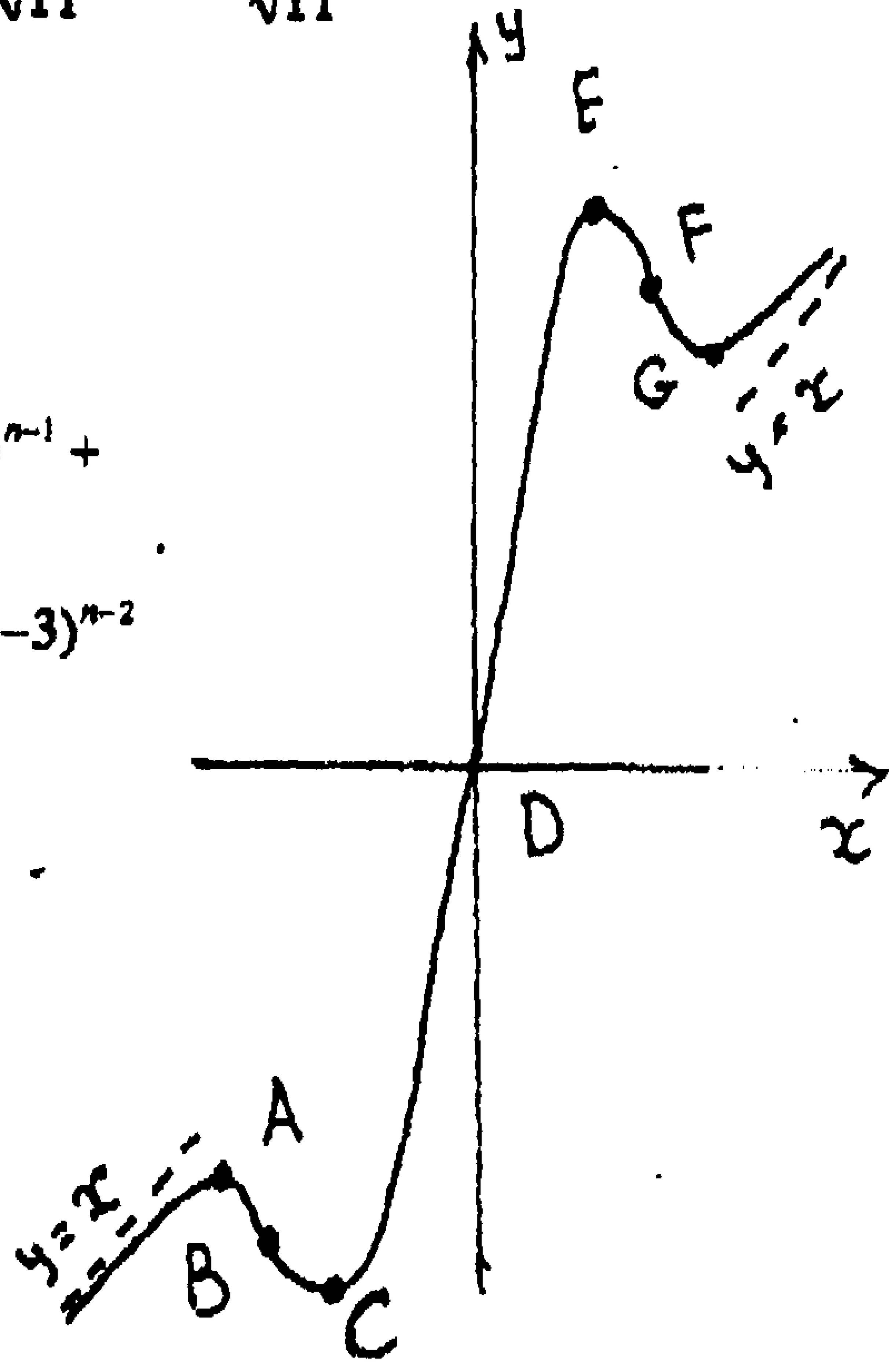
E: *перегиб*, $t_E=-1+\sqrt{3}$, $x(t_E)=3-4\sqrt{3}$ $y(t_E)=6$, $y'_x(t_E)=6+3\sqrt{3}$;

F: *возврат*, $t_F=1$, $x(t_F)=-4$, $y(t_F)=5$, $y'_x(t_F\pm 0)=+\infty$.

Математический анализ, 1 курс, 1 семестр, 2003-2004, Вариант 34

1. $R_{пр} = \sqrt{2}$.

2. а) $\frac{1}{4}\ln(x^2 - x + 3) - \frac{7}{2\sqrt{11}} arctg\frac{2x-1}{\sqrt{11}} + \frac{1}{4}\ln(x^2 + x + 3) + \frac{3}{2\sqrt{11}} arctg\frac{2x+1}{\sqrt{11}} + c$;



2.б) $\frac{5}{6}x^{6/5}\sin(x^{6/5}) + \frac{5}{6}\cos(x^{6/5}) + c$.

3. $$y^{(n)}(x) = (4x - x^2)\cdot\prod_{k=0}^{n-1}(-\frac{4}{3} - k)\cdot(4-3x)^{-\frac{4}{3}-n}\cdot(-3)^n +$$
$$+ n\cdot(4-2x)\cdot\prod_{k=0}^{n-2}(-\frac{4}{3} - k)\cdot(4-3x)^{-\frac{4}{3}-(n-1)}\cdot(-3)^{n-1} +$$
$$+ \frac{n(n-1)}{2}\cdot(-2)\cdot\prod_{k=0}^{n-3}(-\frac{4}{3} - k)\cdot(4-3x)^{-\frac{4}{3}-(n-2)}\cdot(-3)^{n-2}$$

4. $$f(x) = \sum_{k=1}^{n}\frac{1}{k!}C_k(x-1)^k + o\left((x-1)^n\right) \quad при \quad x\to 1,$$
$$где \quad C_k = \frac{e^{-1} + (-1)^k e}{4}\cdot 2^k + \frac{e^{-1} + (-1)^k e}{2}\cdot k.$$

5. а) $y'(x) = \frac{(x^4-1)\cdot(x^4-3)}{(x^4+1)^2}$; $\quad y''(x) = \frac{8x^3\cdot(3x^4-5)}{(x^4+1)^3}$;

асимптоты: $y = x$ при $x \to \pm\infty$;

A: *максимум*, $x_A = -3^{1/4}$, $y(x_A) = -\frac{3}{2}3^{1/4}$, $y'(x_A) = 0$;

B: *перегиб*, $x_B = -\left(\frac{5}{3}\right)^{1/4}$, $y(x_B) = -\frac{7}{4}\left(\frac{5}{3}\right)^{1/4}$, $y'(x_C) = -\frac{1}{8}$;

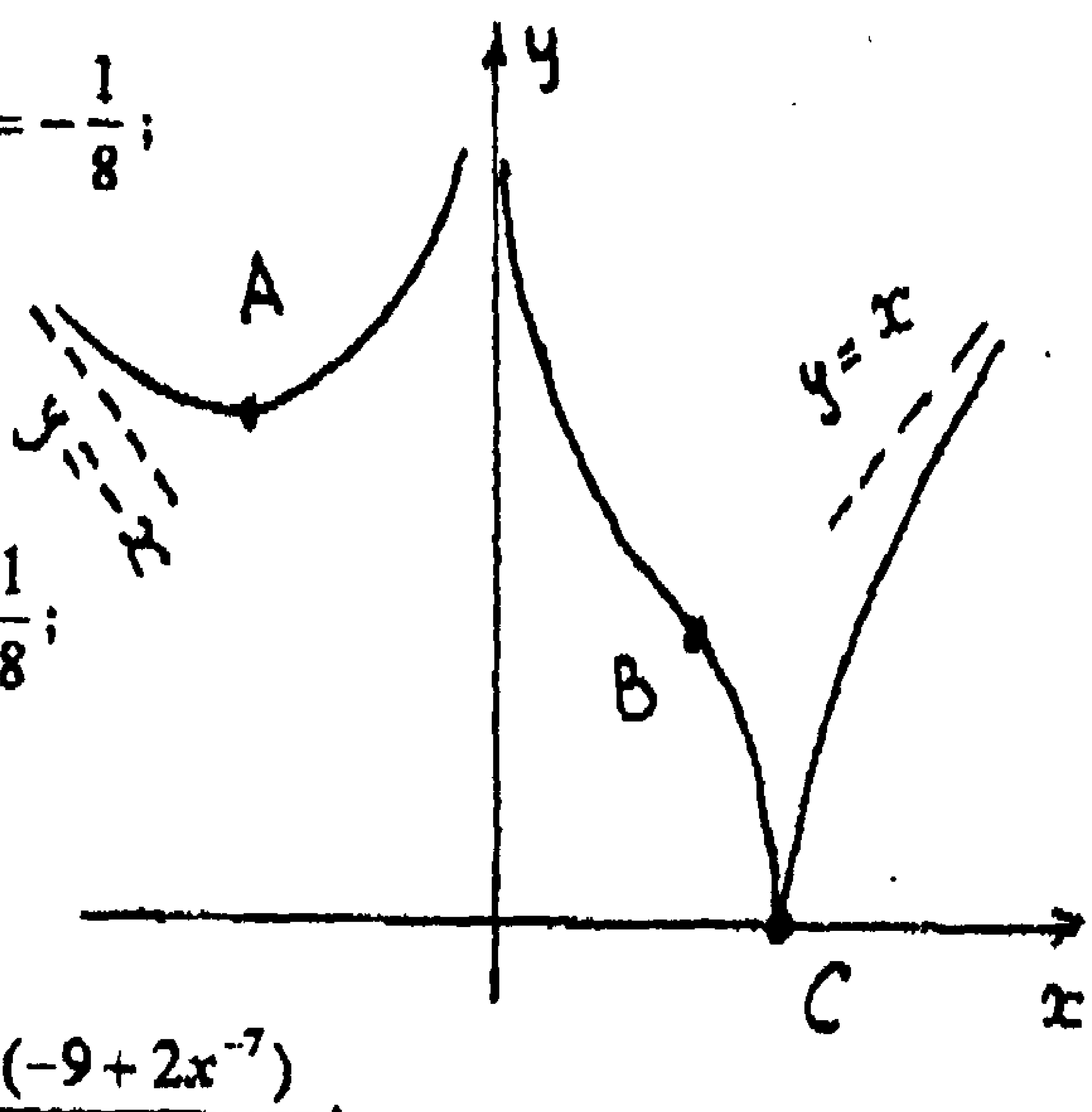
C: *минимум*, $x_C = -1$, $y(x_C) = -2$, $y'(x_C) = 0$;

D: *перегиб*, $x_D = 0$, $y(x_D) = 0$, $y'(x_D) = 3$;

E: *максимум*, $x_E = 1$, $y(x_E) = 2$, $y'(x_E) = 0$;

F: *перегиб*, $x_F = \left(\frac{5}{3}\right)^{1/4}$, $y(x_F) = \frac{7}{4}\left(\frac{5}{3}\right)^{1/4}$, $y'(x_F) = -\frac{1}{8}$;

G: *минимум*, $x_G = 3^{1/4}$, $y(x_G) = \frac{3}{2}(3)^{1/4}$, $y'(x_G) = 0$.



5. б) $y'(x) = sign(x^3 - x^{-4})\frac{3x^2 + 4x^{-5}}{3|x^3 - x^{-4}|^{2/3}}$; $\quad y''(x) = \frac{14(-9 + 2x^{-7})}{9x^3|x^3 - x^{-4}|^{5/3}}$;

асимптоты: $y = \pm x$ при $x \to \pm\infty$;

A: *минимум*, $x_A = -\left(\frac{4}{3}\right)^{1/7}$, $y(x_A) = \left(\frac{4}{3}\right)^{1/7}\left(\frac{7}{4}\right)^{1/3}$, $y'(x_A) = 0$;

B: *перегиб*, $x_B = \left(\frac{2}{9}\right)^{1/7}$, $y(x_B) = \left(\frac{2}{9}\right)^{1/7}\left(\frac{7}{2}\right)^{1/3}$, $y'(x_A) = -7\left(\frac{2}{7}\right)^{2/3}$;

C: *минимум*, $x_C = 1$, $y(x_C) = 0$, $y'(x_C \pm 0) = \pm\infty$.

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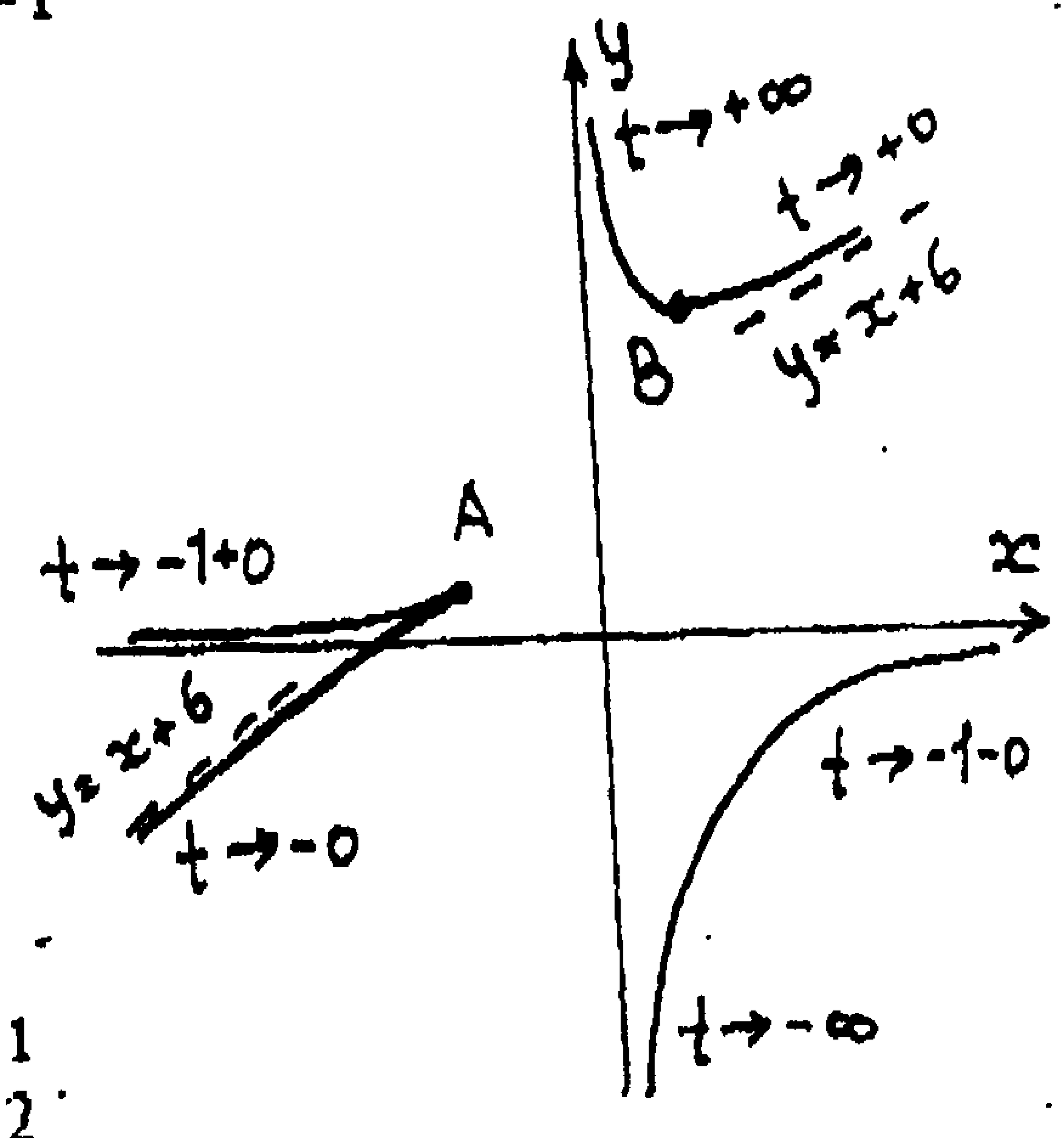
6. *При* $t \to +0$:

$$\frac{2\left(x-\frac{1}{4}x^2-\frac{7}{24}x^3+o\left(x^3\right)\right)-\left(x+\frac{1}{2}x^2+\frac{1}{3}x^3+o\left(x^3\right)\right)-\left(x-x^2+\frac{5}{6}x^3+o\left(x^3\right)\right)}{\left(1+x-\frac{1}{6}x^3+o\left(x^3\right)\right)-\left(x+\frac{1}{2}x^3+o\left(x^3\right)\right)-1} \to \frac{21}{8}.$$

7. $$\left(\frac{2x+\frac{16}{3}x^3+o\left(x^3\right)}{2x-\frac{8}{3}x^3+o\left(x^3\right)}\right)^{\frac{x^2}{\frac{1}{4}x^4+o\left(x^4\right)}} \to e^{16} \text{ при } t \to 0.$$



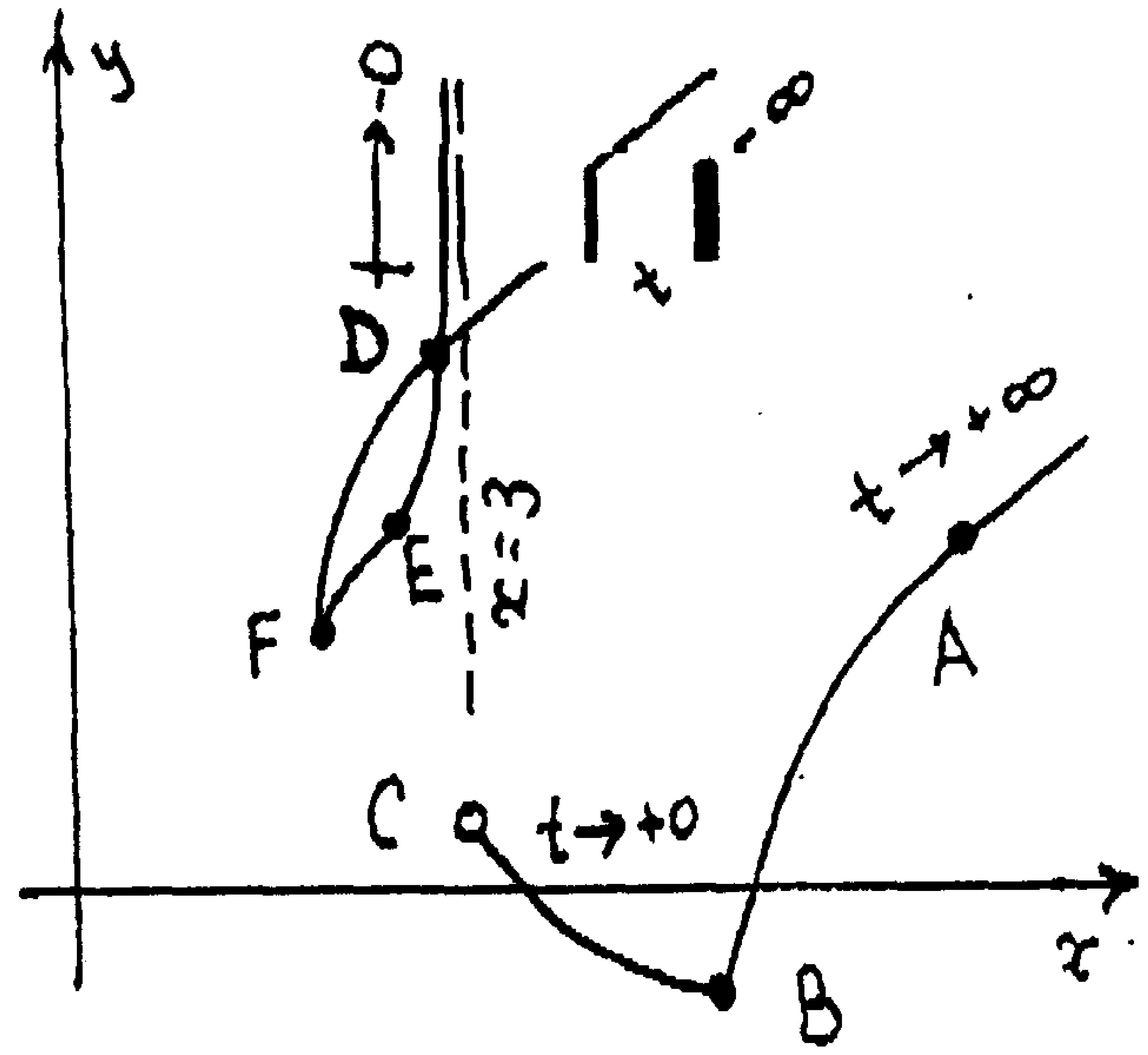
8. $y'_x(t) = -(2t-1)\cdot(t+1)^2;\qquad y''_{xx}(t) = 6\frac{t^3(t+1)^3}{2t+1};$

асимптоты: $x=0$ *при* $t \to \pm\infty$, $y=0$ *при* $t \to -1\pm 0$;

$y = x+6$ *при* $t \to \pm 0$;

[illegible] $\frac{1}{2}$ [illegible] $\frac{1}{2}$.

$B:\ t_B = \frac{1}{2},\ x(t_B) = \frac{4}{3},\ y(t_B) = 9,\ y'_x(t_B) = 0.$



9. $$y'_x(t) = \begin{cases} \frac{t-2}{t+1}, & t \in (-\infty;-1)\cup\left(0;\frac{5}{4}\right) \\ \frac{2t^3+5}{2t^2(t+1)}, & t\in(-1;0)\cup\left(\frac{5}{4};+\infty\right)\end{cases};$$

$$y''_{xx}(t) = \begin{cases} \frac{3}{2(t+1)^3}, & t \in (-\infty;-1)\cup\left(0;\frac{5}{4}\right) \\ \frac{2t^2-15t-10}{4t^3(t+1)^3}, & t\in(-1;0)\cup\left(\frac{5}{4};+\infty\right)\end{cases};$$

асимптоты: $x=3$ *при* $t \to -0$;

A: *перегиб*, $t_A > t_B,\ x(t_A) > x(t_B),\ y(t_A) = \frac{15}{2},\ y'_x(t_A) > 0;$

$B:\ t_B = \frac{5}{4},\ x(t_B) = \frac{113}{16},\ y(t_B) = -\frac{39}{16},\ y'_x(t_B-0) = -\frac{1}{3},\ y'_x(t_B+0) = \frac{57}{45};$

$C:\ t_C = 0,\ x(t_C+0) = 3,\ y(t_C+0) = 1,\ y'_x(t_C+0) = -2;$

D: *самопересечение*, $t_D = -\frac{5}{8},\ \tau_D = -\frac{11}{8},\ x(t_D) = x(\tau_D) = \frac{137}{64},$

$y(t_D) = y(\tau_D) = \frac{537}{64},\ y'_x(t_D) = \frac{231}{15},\ y'_x(\tau_D) = 9;$

E: *перегиб*, $t_E \in \left(-1;-\frac{5}{8}\right),\ x(t_E) \in \left(2;\frac{137}{64}\right),\ y(t_E) = \frac{15}{2},\ y'_x(t_E) > 0;$

F: *возврат*, $t_F = -1,\ x(t_F) = 2,\ y(t_F) = 6,\ y'_x(t_F \pm 0) = +\infty.$