Задорожний Антон 219/5

Задорожний Антон 219/5 Правило Лопиталя

1) $\lim\limits_{x \to -1} \frac{3x^2-2x+1}{-x^2+x+2} = \frac{2}{0}$

пример не подходит

2) $\lim\limits_{x \to 0} \frac{x \operatorname{ctg} 3x}{1} = \lim\limits_{x \to 0} \frac{x}{\operatorname{tg} x} = \frac{0}{0}$

$\lim\limits_{x \to a} \frac{f'(x)}{g'(x)}$

$f(x) = x \qquad g(x) = \operatorname{tg} 3x$

$f'(x) = 1 \qquad g'(x) = 3\operatorname{tg}(x^2) + 3$

$\lim\limits_{x \to 0} \frac{1}{3\operatorname{tg}(3x)^2+3} = \frac{1}{3}$

3) $\lim\limits_{x \to -3} \left(\frac{6}{9-x^2} - \frac{1}{x+3}\right) = \lim\limits_{x \to -3} \frac{6-3+x}{9-x^2} = \lim\limits_{x \to -3} \frac{3+x}{9-x^2} =$

$\lim\limits_{x \to -3} \frac{1}{3-x} = \frac{1}{6}$

$\lim\limits_{x \to a} \frac{f'(x)}{g'(x)}$

$f(x) = 1 \qquad g(x) = 3-x$

$f'(x) = 0 \qquad g'(x) = -1$

$\lim\limits_{x \to -3} = \frac{0}{-1} = 0$

4) $\lim\limits_{x \to 1} x^{\frac{1}{1-x}}$

$\lim\limits_{x \to 1} \frac{\ln(x)}{-x+1} = \frac{0}{0}$

$$\lim_{x\to a}\frac{f'(x)}{g'(x)} \quad f(x)=\ln x \quad g(x)=-x+1$$

$$f'(x)=\frac{1}{x} \quad g'(x)=-1$$

$$\lim_{x\to 1}=\frac{\frac{1}{x}}{-1}=\frac{1}{-1}=-1$$

5) $\lim_{x\to\frac{1}{2}}(tg x)^{\cos x}$ $\quad \lim_{x\to a}\frac{f'(x)}{g'(x)}$

$$\lim_{x\to\frac{1}{2}}\frac{\ln(tg x)}{\frac{1}{\cos x}} \quad f(x)=\ln(tg x) \quad g(x)=\frac{1}{\cos x}$$

$$f'(x)=\frac{tg x^2+1}{tg} \quad g'(x)=\frac{\sin x}{\cos x^2}$$

$$\lim_{x\to\frac{1}{2}}\frac{\frac{tg x^2+1}{tg x}}{\frac{\sin x}{\cos x}}=\frac{tg\left(\frac{1}{2}\right)+\frac{1}{tg\left(\frac{1}{2}\right)}}{\frac{2\sin\left(\frac{1}{2}\right)}{(\cos(1)+1)}}=\frac{\cos(1)+1\cdot tg\left(\frac{1}{2}\right)+\frac{1}{tg\left(\frac{1}{2}\right)}}{2\sin\left(\frac{1}{2}\right)}$$

6) $\lim_{x\to 0} x^{\frac{4}{1-2\ln x}}=\lim_{x\to 0}\frac{\ln x}{-\frac{\ln x}{2}+\frac{1}{4}}=\frac{\infty}{\infty}$

$$\lim_{x\to a}\frac{f'(x)}{g'(x)}$$

$$f(x)=\ln x) \quad g(x)=-\frac{\ln x}{2}+\frac{1}{4}$$

$$f'(x)=\frac{1}{x} \quad g'(x)=-\frac{1}{2x}$$

$$\lim_{x\to 0}=\frac{\frac{1}{x}}{\frac{1}{-2x}}=\frac{2\infty}{2\infty}$$ - неизвестно

Применение функции
приближ вычислен.

1) $y=3x^2+5x+1$

$\Delta y - ?$ $\quad x_1 = 3$

$\Delta y = y_2 - y_1$ $\quad x_2 = 3{,}001$

$\Delta y_1 = 3 \cdot 3^2 + 5 \cdot 3 + 1 = 27 + 15 + 1 = 43$

$y_2 = 3 \cdot (3{,}001)^2 + 5 \cdot 3{,}001 + 1 = 3 \cdot 9{,}006001 + 15{,}005 =$

$24{,}01803 + 15{,}005 + 1 = 43{,}02303$

$\Delta y = 43{,}02303 - 43 = \underline{0{,}02303}$

2) $y = x^3 - 4x^2 - 6x + 3$ $\quad x = 1{,}03$

$y = 1{,}092727 - 4 \cdot 1{,}0609 - 6{,}18 + 3 =$

$10{,}272727 - 0{,}2436 = \underline{10{,}029127}$

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ПР №2.

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

$y'=\left(\frac{1}{3}x^3+2x^2-\frac{1}{3}\right)'=y'=\left(\frac{1}{3}x^3\right)'+\left(2x^2\right)'-\left(\frac{1}{3}\right)'=$

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

$y'=x^2+4x$

$x^2+4x=0$

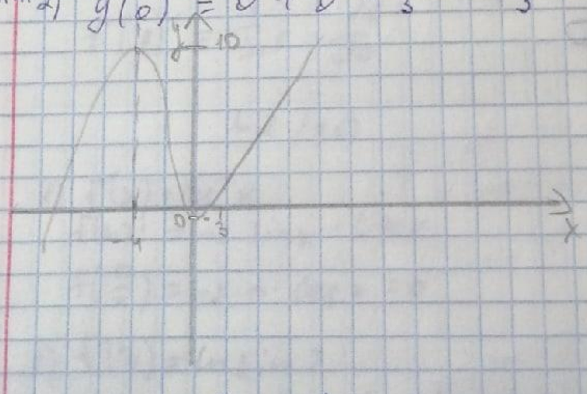
$+\quad -4\quad -\quad 0\quad +$

$x(x+4)=0$

$x_1=0 \quad x_2=-4$

max 1) $y(-4)=\frac{1}{3}(-4)^3+2(-4)^2-\frac{1}{3}=-\frac{64}{3}+32-\frac{1}{3}=\frac{31}{3}=10\frac{1}{3}$

min 2) $y(0)=0+0-\frac{1}{3}=-\frac{1}{3}$



3. $S=-t^3+6t^2+24t-5$

$(V)'=\frac{(S(t))'}{(t)'}=-3t^2+12t+24$

Найдем знач t при $V=max$

$V'(t) = -6t + 12 \qquad -6t + 12 = 0 \qquad t = 2$

Исслед. $V'(t)$ на измен. знака

$t = 1 < 2 \quad V'(1) = 6 > 0 \qquad t = 3 > 2 \cdot V'(t) = -6 < 0$

След. точка $t = 2$ есть точка макс.

$V_{max} = -3 \cdot 4 + 12 \cdot 2 + 24 = 36$

2. $y = \frac{2}{3}x^3 + 4x^2 - 10$

$y' = \left(\frac{2}{3}x^3\right)' + \left(4x^2\right)' - (10)' \Rightarrow y' = \frac{2}{3} \cdot 3x^2 + 4 \cdot 2x - 0$

$y' = 2x^2 + 8x$

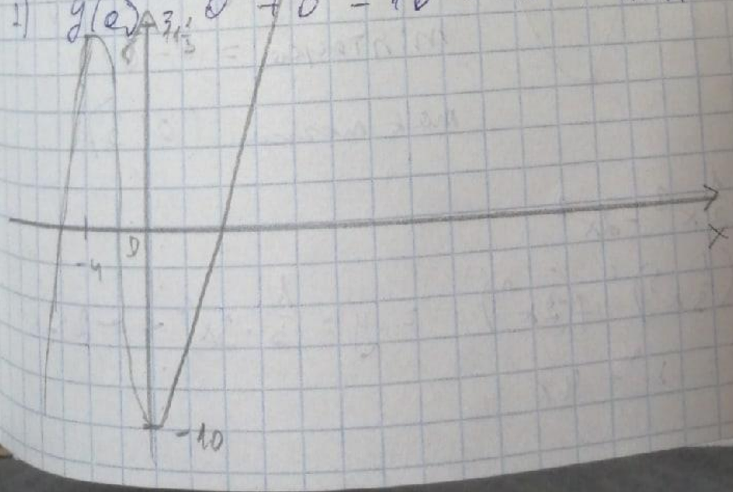
$2x^2 + 8x = 0$

$x(2x + 8) = 0$

$x_1 = 0 \qquad x_2 = -4$

1) $y(-4) = \frac{2}{3}(-4)^3 + 4(-4)^2 - 10 = -\frac{128}{3} + 64 - 10 = 11\frac{1}{3}$ max

2) $y(0) = 0 + 0 - 10 = -10$ min



3. $s = -t^3 + 9t^2 - 24t + 1$

$(V)' = -3t^2 + 18t - 24$

Найдем знач t при V_{max}

$(V)' = -6t + 18 = 0$

$t = 3$

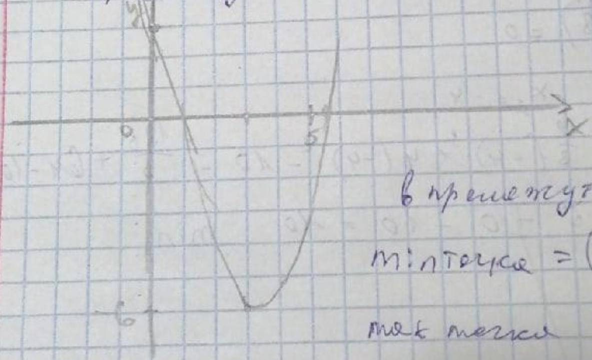
$V_{max} = -3 \cdot 3^2 + 18 \cdot 3 - 24 = -27 + 54 - 24 = 3$

2. $y = x^2 - 6x + 3$

Найдем мин. знач. функц. $x = \frac{-6}{2 \cdot 1} = 3$

$y = 3^2 - 6 \cdot 3 + 3 = 3 \cdot -2 = -6$ минимум

пересеч. с $y = 0^2 - 6 \cdot 0 + 3 = 3$



в промежутке от 0 до 5

min точка $= (3; -6)$

max точка $(0; 3)$

3. $y = \frac{1}{3}x^3 - 2x^2$

$y' = \left(\frac{1}{3}x^3\right)' + \left(-2x^2\right)' = y' = \frac{1}{3} \cdot 3x^2 + -2 \cdot 2x$

$y' = x^2 - 4x$

$x^2 - 4x = 0$

$x(x-4) = 0$

$x_1 = 0 \quad x_2 = 4$

1) $y(4) = \frac{1}{3}(4)^3 - 2(4)^2 = \frac{64}{3} - 32 = -10\frac{2}{3}$

2) $y(0) = 0$