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(Ex 1) (1 pt) Find the domain of  $f(x) = \log_{3x-12}(x^2 - 9)$ .

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(Ex 2) (0.5 pt) Calculate the exact value of  $4^{\log_6 4 - \log_6 \frac{1}{9}}$ .

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(Ex 3) (2 pts) Let  $f(x) = 3 \log_2(5x + 1)$ , find: the inverse function  $f^{-1}(x)$ ,  $D_f$ ,  $Y_f$ ,  $D_{f^{-1}}$  and  $Y_{f^{-1}}$ .

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(Ex 4) (1.5 pts) Solve  $\log_{0.5}(x - 3) - \log_{0.5}(3 + x) < 2$

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(Ex 5) (0.5 pt) Calculate  $\sin\left(\frac{5\pi}{6}\right) + \cos\left(\frac{7\pi}{4}\right) - \tan\left(\frac{2\pi}{3}\right)$ .

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(Ex 6) (1 pt) Prove that  $\cos(2x) = \frac{1 - \tan^2(x)}{1 + \tan^2(x)}$ .

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**Theory.** (1 pt) Give a definition of a bounded sequence.

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(Ex 7) (1 pt) Draw the graph of  $f(x) = |2 \sin(x + \frac{\pi}{2}) - 1|$  step by step and find  $D_f$  and  $Y_f$ .



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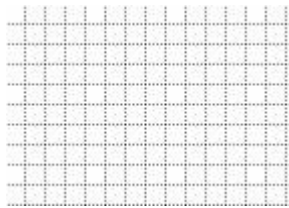
(Ex 8) (2x1 pt) Solve: a)  $\sin(2x) = \frac{\sqrt{2}}{2}$ ,

b)  $\tan^3(x) - 1 = -\tan^2(x) + \tan(x)$ .



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(Ex 9) (1.5 pts) Find  $D_f$ ,  $Y_f$  and draw the graph of  $f(x) = 2 \arcsin(\frac{x-1}{2}) + \frac{\pi}{4}$ .



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(Ex 10) (1 pt) It is known, that in some geometric sequence  $a_4 = 2$ . Calculate  $a_1 \cdot a_2 \cdot a_3 \cdot a_4 \cdot a_5 \cdot a_6 \cdot a_7$ .



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(Ex 11) (4x0.5 pt) Calculate limits:

a)  $\lim_{n \rightarrow \infty} \frac{3 \cdot 3^{2n+1} - 2 \cdot 2^n + 2}{4 \cdot 4^n - 5 \cdot 9^n + 7} =$

b)  $\lim_{n \rightarrow \infty} \left(\frac{2n-1}{2n+3}\right)^{2n+2} =$

c)  $\lim_{n \rightarrow \infty} \sqrt[n]{e^n + \pi^n + \cos(n)} =$

d)  $\lim_{n \rightarrow \infty} \frac{2+4+6+\dots+2n}{1+2+3+\dots+n} =$

