

Corso di Analisi Matematica T-1
Corso di Laurea in Ingegneria dell'Automazione
Anno Accademico 2023/24

Esercizi

A) Calcolare i seguenti limiti:

1. $\lim_{x \rightarrow 0} \frac{2x^3 - 3x^2 + 5x}{x^4 - x}$

2. $\lim_{x \rightarrow +\infty} \frac{2x^3 - 3x^2 + 5x}{x^4 - x}$

3. $\lim_{x \rightarrow -\infty} \frac{2x^4 - 3x^3 + 5x}{x^6 - x^2}$

4. $\lim_{x \rightarrow 2} \frac{x^3 - 4x^2 + 5x - 2}{x^2 - 4}$

5. $\lim_{x \rightarrow 1^-} \frac{x^2 - 1}{x^3 - 3x + 2}$

6. $\lim_{x \rightarrow 0} \frac{2x^5 - \sin x + 5x^2}{x^2 - x}$

7. $\lim_{x \rightarrow 0} \frac{\sin(x + x^4)}{x^3 - x}$

8. $\lim_{x \rightarrow 0} \frac{\sin(3x)}{\operatorname{tg}(5x)}$

9. $\lim_{x \rightarrow 0} \frac{x \sin(3x) + x^4}{2x^2 + x \sin(2x^3)}$

10. $\lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x \sin(4 - x)}$

11. $\lim_{x \rightarrow \pi/2} \frac{\sin(2x)}{\cos x}$

12. $\lim_{x \rightarrow 0} \frac{\sin(x^2)}{\sin(x^2) + x}$

13. $\lim_{x \rightarrow 0^+} \frac{\sqrt{x + x^2} - \sqrt{x + 2x^2}}{x \sqrt{x + 3x^2}}$

14. $\lim_{x \rightarrow 0} \frac{\sqrt{4 + x^2} - 2}{\sqrt{1 + x} - 1}$

15. $\lim_{x \rightarrow +\infty} \frac{3 + 2\sqrt{x}}{\sqrt{x} - \sin x}$

16. $\lim_{x \rightarrow +\infty} \frac{\sqrt{1 + x} - 1}{e^{3x} - 1}$

17. $\lim_{x \rightarrow 0} \frac{\sin(2x^2)}{\cos^2 x \sin^2 x}$

18. $\lim_{x \rightarrow 0^-} \frac{\log(1 + 4x^2)}{\sin(x^3 + 4x^4)}$

19. $\lim_{x \rightarrow +\infty} (\sqrt{x^4 + 1} - \sqrt{x^4 + x^2 + 1})$

20. $\lim_{x \rightarrow 0^-} \frac{\sqrt{x^2 + 2x^3} + x}{\sin^2 x}$

21. $\lim_{x \rightarrow 0^+} \frac{\sqrt{x^2 + 2x^3} + x}{\sin^2 x}$

22. $\lim_{x \rightarrow 0} \frac{x(e^{3x-x^2} - 1) \cos(3x)}{\cos(x + x^2) - 1}$

23. $\lim_{x \rightarrow +\infty} x^2(e^{2/x} - 1)$

24. $\lim_{x \rightarrow -\infty} x^2(e^{2/x} - 1)$

25. $\lim_{x \rightarrow +\infty} (x + 3)^2 \log \frac{2x^2}{2x^2 + 1}$

26. $\lim_{x \rightarrow 0} \frac{1 - \cos(x^2 - x^3)}{(x^2 - 2x^3) \sin(x^2 - 3x^3)}$

27. $\lim_{x \rightarrow 0} \frac{\sqrt{x} \sin(\sqrt{2x})}{x + 3x^{3/2} - \sin(x^2)}$

28. $\lim_{x \rightarrow 0} \frac{\exp(\sqrt{x^5 + 3x^{10}}) - 1}{\cos(3 + x^5) \sin(\sqrt{2x^5})}$

$$29. \lim_{x \rightarrow 0} \frac{\log \frac{x + x^9}{x + 2x^8}}{\sqrt{x^4 + 8x^6} \sin(x^5)}$$

$$30. \lim_{x \rightarrow 0} \frac{\sqrt{x^4 + 2x^6} \sin(5x^2)}{\log(\cos(4x^2 + 2x^3))}$$

$$31. \lim_{x \rightarrow 0} \frac{\cos(6x^2) - 1}{x^2(\log(x^2 + 3) - \log 3)}$$

$$32. \lim_{x \rightarrow 0} \frac{\exp\left(\frac{3 + 7x^2}{1 + 3x}\right) - e^3}{\log\left(\frac{3 + 7x}{3 + 3x^2}\right) \cos\left(\frac{3 + 7x}{3 + 3x^2}\right)}$$

$$33. \lim_{x \rightarrow +\infty} \frac{e^{2x} - x^3 + 1}{e^x + 3x^4}$$

$$34. \lim_{x \rightarrow +\infty} \frac{e^{x+1} + e^{x/2} - x^2}{e^{x-1} - e^{x/2}}$$

$$35. \lim_{x \rightarrow -\infty} \frac{e^{x+1} + e^{x/2} - x^2}{e^{x-1} - e^{x/2}}$$

$$36. \lim_{x \rightarrow +\infty} x^4 \log\left(2 - \exp(3\sqrt{x^{-8} + x^{-16}})\right)$$

$$37. \lim_{x \rightarrow +\infty} (\sqrt{x^4 + x^3} - x^2) \left(\exp\left(\frac{x}{x+2}\right) - e\right)$$

$$38. \lim_{x \rightarrow +\infty} \frac{\log \frac{x^2}{\sqrt{x^4 + 2x^3}}}{\sin \frac{x}{\sqrt{3x^4 + 2x^3}}}$$

$$39. \lim_{x \rightarrow +\infty} \sqrt{x^4 + x^2} (e^{1/(x+3)} - 1) \sin \frac{1}{2x+1}$$

$$40. \lim_{x \rightarrow +\infty} \log\left(\frac{x^4 + 3}{x^4 + 1}\right) \exp(1 + 5 \log(x^2)) x^{-6}$$

Soluzioni

A)

1. -5

2. 0

3. 0

4. $\frac{1}{4}$

5. $-\infty$

6. 1

7. -1

8. $\frac{3}{5}$

9. $\frac{3}{2}$

10. $-\frac{1}{16}$

11. 2

12. 0

13. $-\frac{1}{2}$

14. 0

15. 2

16. 0

17. 2

18. $-\infty$

19. $-\frac{1}{2}$

20. -1

21. $+\infty$

22. -6

23. $+\infty$

24. $-\infty$

25. $-\frac{1}{2}$

26. $\frac{1}{2}$

27. $\sqrt{2}$

28. $\frac{1}{\sqrt{2} \cos 3}$

29. -2

30. $-\frac{5}{8}$

31. -54

32. $-\frac{27e^3}{7 \cos 1}$

33. $+\infty$

34. e^2

35. $+\infty$

36. -3

37. $-e$

38. $-\sqrt{3}$

39. $\frac{1}{2}$

40. $2e$