Corso di Analisi Matematica T-A
Corso di Laurea in Ingegneria Meccanica
Anno Accademico 2019/20

Esercizi

A) Calcolare i seguenti limiti:

1. $\displaystyle\lim_{x\to 0} \frac{\sin(2x) - \tan(2x + x^3)}{x(1 - \cos^2 x)}$

2. $\displaystyle\lim_{x\to 0} \frac{\log(1 + x^2) - \sin^2 x}{(1 - \cos x + x^4)^2}$

3. $\displaystyle\lim_{x\to 0} \frac{(1 + x)^{11} - (1 + x + x^2)^{11}}{e^{x^8} - 1}$

4. $\displaystyle\lim_{x\to 0} (e^x + x)^{1/x}$

5. $\displaystyle\lim_{x\to+\infty} x\left(\sqrt{4 + \frac{5}{x}} - 2\cos\frac{1}{x}\right)$

6. $\displaystyle\lim_{x\to 0} \frac{(\cos(2x) + \cosh(2x) - 2)\tan(x + 3)}{\sin^2(3x) - 9x^2}$

7. $\displaystyle\lim_{x\to+\infty} \frac{\sqrt[3]{x^3 + 3x^2} - \sqrt{x^2 + 3x}}{\sqrt{x^4 + x^2} - \sqrt{x^4 + 1}}$

8. $\displaystyle\lim_{x\to 0} \frac{\sqrt{4 + x^2} - \sqrt[3]{8 + 3x^2}}{x\sin(2x) + \cos(2x + 2x^2) - e^{3x^4}}$

9. $\displaystyle\lim_{x\to+\infty} \frac{2(x + 3)^{3/2} - 2x^{3/2} - 9(x + 3)^{1/2}}{\sin\big((x + 2)^{-1/2}\big)}$

10. $\displaystyle\lim_{x\to+\infty} \frac{\sqrt{x^3 + 2x} - \sqrt{x^3 + 5}}{e^x\big(\exp(x + 3e^{-x}) - \exp(x) - 3\big)}$

11. $\displaystyle\lim_{x\to 0^+} \frac{\sqrt{e^x + x} - \cosh(\sqrt{2x})}{\exp\big(\sqrt{1 + 2x}\,\big) - e\,\sqrt{1 + 2x}}$

12. $\displaystyle\lim_{x\to 0} \frac{x^2\big(e^{-2x^2} - (1 + 4x^2)^{-1/2}\big)}{\sin x\,\sinh x - x^2}$

13. $\displaystyle\lim_{x\to 0k} \frac{\big(\sinh^2(2x) - \sin^2(2x)\big)\cos(2x)}{\sqrt{x^2 + 7x^5} - \sqrt{x^2 + 8x^5}}$

14. $\displaystyle\lim_{x\to+\infty} \big(\sqrt{x^2 + 6x - 4} - xe^{3/x}\big)\log(1 + e^{2x})$

15. $\displaystyle\lim_{x\to 0} \frac{\sin(x - \sin x)}{\sinh(x - \sinh x)}$

16. $\displaystyle\lim_{x\to 0} \frac{2\exp(\cos x) + e\log(1 + x^2) - 2e}{\big(\exp(\cos^2 x) - e\big)^2}$

17. $\displaystyle\lim_{x\to+\infty} \left(x^2\exp\Big(\frac{x + 3}{x^2 - 4}\Big) - x^2 - x\right)$

18. $\displaystyle\lim_{x\to+\infty} \left(2x(x - 2) - x^3\log\left(1 + \sin\frac{2}{x}\right)\right)$

19. $\displaystyle\lim_{x\to+\infty} x^4\left(\exp\Big(\frac{2x^2}{2x^2 + 1}\Big) - \exp\Big(\cos\frac{1}{x}\Big)\right)$

20. $\displaystyle\lim_{x\to 0} \left(\frac{\sin(4x)}{1 - \cos(4x)} - \frac{\cos(3x)}{\sin(2x)}\right)$

21. $\displaystyle\lim_{x\to+\infty} x^4\left(\log\Big(\cos\frac{3}{x}\Big) - \cos\frac{3}{x} + 1\right)$

22. $\displaystyle\lim_{x\to+\infty} \frac{x^2\log\left(\dfrac{5 + x^2}{3 + x^2}\right) - 2}{\exp\left(\sin\dfrac{5}{x}\right) - 1 - \dfrac{5}{x}}$

23. $\displaystyle\lim_{x\to 0} \frac{\exp(3\cos x) + \exp(3\cosh x) - 2e^3}{\big(\cos(3x)\cosh(3x) - 1\big)\big(\cos(e^x) - 1\big)}$

24. $\displaystyle\lim_{x\to+\infty} x^4\left(\exp\Big(\frac{3x^2}{x^2 + 4}\Big) - e^3 + \frac{12e^3}{x^2}\right)$

25. $\displaystyle\lim_{x\to+\infty} \frac{\exp\left(5x\cos\dfrac{4}{x}\right) - 2\sinh(5x)}{\left(\sqrt{x^6 + 6x^4} - x^3\exp\left(\dfrac{3}{x^2}\right)\right)e^{5x}}$

26. $\displaystyle\lim_{x\to 0^+} \frac{\big(\exp\big(\sqrt{x^2 + 5x^3}\,\big) - e^x\big)\sin(2x^2)}{\big(\cos\big(\sqrt{4x}\,\big) - e^{-2x}\big)^2}$

Soluzioni

A)

1. -5

2. $-\dfrac{2}{3}$

3. $-\infty$

4. e^2

5. $\dfrac{5}{4}$

6. $-\dfrac{4}{81}\tan 3$

7. -1

8. 0

9. $-\dfrac{27}{4}$

10. 0

11. $-\dfrac{5}{6e}$

12. 360

13. $-\dfrac{64}{3}$

14. -22

15. -1

16. $-\dfrac{1}{6e}$

17. $\dfrac{7}{2}$

18. $-\infty$

19. $\dfrac{5e}{24}$

20. 0

21. $-\dfrac{81}{8}$

22. $-\dfrac{16}{25}$

23. $-\dfrac{5e^3}{27(\cos 1 - 1)}$

24. $120e^3$

25. $\dfrac{40}{9}$

26. $\dfrac{45}{16}$