

7. Integroi $\cos(x)$ välillä $x \in (-10, 10)$.

NIntegrate[Cos[x], {x, -10, 10}]

-1.08804

8. Kirjoita $\tan(x)$:n sarjakehitelmä 5:n ympäristössä. Ota kehitelmään 5 ensimmäistä termiä.

Series[Tan[x], {x, 5, 5}]

$$\begin{aligned} & \tan[5] + (1 + \tan[5]^2) (x - 5) + \left(\frac{\tan[5]}{2} + \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) \right) (x - 5)^2 + \\ & \left(\frac{1}{3} + \frac{\tan[5]^2}{2} + \tan[5] \left(\frac{\tan[5]}{3} + \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) \right) \right) (x - 5)^3 + \\ & \left(\frac{5 \tan[5]}{24} + \frac{1}{2} \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) + \tan[5] \right. \\ & \quad \left. \left(-\frac{1}{24} - \frac{\tan[5]^2}{6} + \frac{1}{2} \left(\frac{1}{2} + \tan[5]^2 \right) - \tan[5] \left(-\frac{\tan[5]}{3} - \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) \right) \right) \right) \\ & (x - 5)^4 + \left(-\frac{1}{30} - \frac{\tan[5]^2}{8} + \frac{1}{6} \left(-\frac{1}{2} - \tan[5]^2 \right) + \frac{1}{2} \left(\frac{1}{2} + \tan[5]^2 \right) - \right. \\ & \quad \tan[5] \left(-\frac{\tan[5]}{3} - \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) \right) - \frac{1}{2} \tan[5] \left(\frac{\tan[5]}{3} + \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) \right) + \\ & \quad \tan[5] \left(-\frac{\tan[5]}{30} + \frac{1}{6} \tan[5] \left(-\frac{1}{2} - \tan[5]^2 \right) + \right. \\ & \quad \left. \frac{1}{2} \left(\frac{\tan[5]}{3} + \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) \right) + \tan[5] \left(-\frac{1}{24} - \frac{\tan[5]^2}{6} + \frac{1}{2} \left(\frac{1}{2} + \tan[5]^2 \right) - \right. \\ & \quad \left. \left. \tan[5] \left(-\frac{\tan[5]}{3} - \tan[5] \left(\frac{1}{2} + \tan[5]^2 \right) \right) \right) \right) \right) (x - 5)^5 + 0 [x - 5]^6 \end{aligned}$$

9. Ratkaise differentiaaliyhtälö $12 x''(t) - 9 x'(t) + 16 x(t) - 9 = 0$ alkuarvoilla $x(0) = 2$ ja $x'(0) = 0$.

Clear[guru, x, t]

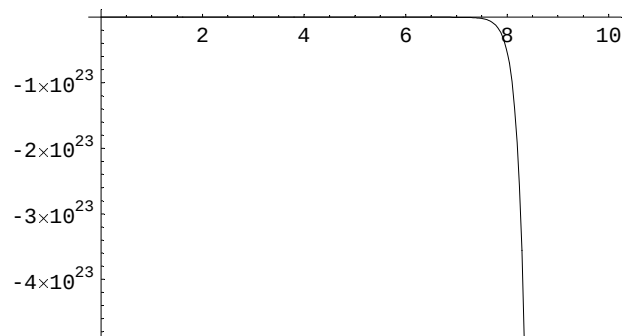
guru = DSolve[{x''[t] - 9 x'[t] + 16 x[t] - 9 == 0, x[0] == 2, x'[0] == 0}, x[t], t]

{ {x[t] → $\frac{1}{544} (306 + 391 e^{\frac{1}{2} (9 - \sqrt{17}) t} + 207 \sqrt{17} e^{\frac{1}{2} (9 - \sqrt{17}) t} + 391 e^{\frac{1}{2} (9 + \sqrt{17}) t} - 207 \sqrt{17} e^{\frac{1}{2} (9 + \sqrt{17}) t})$ } }

guru[[1, 1, 2]]

$\frac{1}{544} (306 + 391 e^{\frac{1}{2} (9 - \sqrt{17}) t} + 207 \sqrt{17} e^{\frac{1}{2} (9 - \sqrt{17}) t} + 391 e^{\frac{1}{2} (9 + \sqrt{17}) t} - 207 \sqrt{17} e^{\frac{1}{2} (9 + \sqrt{17}) t})$

`Plot[x[t] /. guru, {t, 0, 10}]`



- Graphics -

10. Mieti, miten saisit näppärästi määriteltyä edellisen tehtävän ratkaisua vastaavan funktion.

`x[t_] = x[t] /. guru[[1]]`

$$\frac{1}{544} \left(306 + 391 e^{\frac{1}{2} (9 - \sqrt{17}) t} + 207 \sqrt{17} e^{\frac{1}{2} (9 - \sqrt{17}) t} + 391 e^{\frac{1}{2} (9 + \sqrt{17}) t} - 207 \sqrt{17} e^{\frac{1}{2} (9 + \sqrt{17}) t} \right)$$

`x[0]`

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