**Probleem 1:** Bepaal 'n familie van oplossings vir elkeen die volgende DVs:

**(a)** $\dfrac{dy}{dx} = e^{x-2y}$ **(b)** $x\dfrac{dy}{dx} - y = x^2 \sin x$ **(c)** $x^2\dfrac{dy}{dx} + xy - 1 = 0$

**Problem 1:** Determine a family of solutions for each of the following DEs:

**Probleem 2:** Daar was aanvanklik 100 milligram van 'n radio-aktiewe substans teenwoordig. Ná 6 ure het die massa met 3% verminder.

**(a)** Indien die tempo van verval direk-eweredig is aan die hoeveelheid teenwoordig op tyd $t$, vind die massa wat ná 24 uur oorbly.

**(b)** Bepaal die halfleeftyd van hierdie radio-aktiewe substans.

**Problem 2:** Initially 100 milligrams of a radioactive substance was present. After 6 hours the mass had decreased by 3%.

**(a)** If the rate of decay is proportional to the amount of the substance present at time $t$, find the mass remaining after 24 hours.

**(b)** Determine the half-life of this radioactive substance.

**Probleem 3:** Gebruik 'n integrasiefaktor om die volgende lineêre aanvangswaardeprobleem op te los:

$$\frac{dT}{dt} = k(T_m - T), \quad T(0) = T_0,$$

waar $k$, $T_m$ en $T_0$ konstantes is.

**Problem 3:** Use an integration factor to solve the following linear initial value problem:

where $k$, $T_m$ and $T_0$ are constants.

**Probleem 4:** 'n Dooie liggaam is in 'n geslote kamer, waarvan die temperatuur konstant op 21°C bly, gevind. Teen 16:00, die tyd van ontdekking, is die liggaamstemperatuur bepaal as 29°C. 'n Tweede meting een uur later (teen 17:00) het gewys dat die temperatuur van die liggaam 26.5°C is. Bepaal die tyd van afsterwe, as daar aanvaar word dat die liggaamstemperatuur van 'n lewende mens 37°C is.

**Problem 4:** A dead body was found within a closed room where the temperature remained constant at 21°C. At 16:00, the time of discovery, the core temperature of the body was determined to be 29°C. One hour later (at 17:00) a second measurement showed that the core temperature of the body was 26.5°C. Determine the time of death, assuming that the core temperature of a living person is 37°C.

**Probleem 5:** Zill & Wright, 8 uit., bl. 91, nr. 14:

**Problem 5:** Zill & Wright, 8 ed., p. 91, nr. 14:

**13.** A thermometer is taken from an inside room to the outside where the air is 5°F. After 1 minute the thermometer reads 55°F and after 5 minutes it reads 30°F. What was the temperature of the inside room?

**Probleem 6:** Zill & Wright, 8 uit., bl. 91, nr. 16:

**Problem 6:** Zill & Wright, 8 ed., p. 91, nr. 16:

**16.** Two large containers $A$ and $B$ of the same size are filled with different fluids. The fluids in containers $A$ and $B$ are maintained at 0°C and 100°C, respectively. A small metal bar, whose initial temperature is 100°C, is lowered into container $A$. After 1 minute the temperature of the bar is 90°C. After 2 minutes the bar is removed and instantly transferred to the other container. After 1 minute in container $B$ the temperature of the bar rises 10°. How long, measured from the start of the entire process, will it take the bar to reach 99.9°C?

**Probleem 7:** Ek het besluit om nog 'n vraag by die tutoriaalblad te voeg: Gaan terug na die mengselprobleem in Lesing 8. Die fabriek besluit dat hulle slegs die konsentrasie hoef te verminder van $0.3kg/l$ na $0.2kg/l$ in een uur en wil dus graag die vloeitempo verminder om kostes te bespaar. Bepaal die vereiste vloeitempo, $F$.

**Problem 7:** Recall the mixtures problem from Lecture 8. The factory decides they need only reduce the concentration from $0.3kg/l$ to $0.2kg/l$ in one hour and hence wishes to reduce the flow rate in order to save on costs. Determine the required flow rate, $F$.

**Probleem 8:** Voltooi die oefeninge op skyfie 5 van Lesing 9.

**Problem 8:** Complete the exercises on slide 5 of Lecture 9.