

## Key Problems

### Problem 1.

Solve the differential equations:

a)  $y' = 3t^2 + 2$

b)  $ty' = 1$

c)  $y' = t\sqrt{t^2 + 1}$

### Problem 2.

Solve the differential equations:

a)  $y' = 5y$

b)  $y' = y^2t$

c)  $y' = 5y(1 - y/10)$

### Problem 3.

Solve the differential equations:

a)  $y' + 3y = 6$

b)  $y' - 2ty = 4t$

c)  $y' + 2y = e^t$

### Problem 4.

Solve the exact differential equations:

a)  $3t^2 - 2t + 2y \cdot y' = 0$

b)  $2y - 3t^2 + 2(y + t)y' = 0$

c)  $\frac{y(1 - 2\ln t)}{t^3} + \frac{\ln t}{t^2} \cdot y' = 0$

## Exercise problems

Problems from the textbook: [E] 7.1 - 7.23

Exam problems: [Final exam 11/2019] Q3ab

## Answers to Key Problems

### Problem 1.

a)  $y = t^3 + 2t + C$

b)  $y = \ln|t| + C$

c)  $y = \frac{1}{3}(t^2 + 1)\sqrt{t^2 + 1} + C$

### Problem 2.

a)  $y = Ke^{5t}$

b)  $y = -2/(t^2 + 2C)$

c)  $y = 10 \cdot Ke^{5t}/(1 + Ke^{5t})$

### Problem 3.

a)  $y = 2 + Ce^{-3t}$

b)  $y = -2 + Ce^{t^2}$

c)  $y = \frac{1}{3}e^t + Ce^{-2t}$

### Problem 4.

a)  $y = \pm\sqrt{t^2 - t^3 + C}$

b)  $y = -t \pm \sqrt{t^2 + t^3 + C}$

c)  $y = \frac{Ct^2}{\ln t}$