

LIST 2.

Differential Equations 1st Order - Continuation (Homogenous, Bernoulli, Exact).

Task 1: Solve the homogeneous equations given below:

a) $y' = e^{y/x} + \frac{y}{x}$; b) $y' = -\frac{x+y}{x}$; c) $y' = \frac{y}{x} - 1$;

d) $ydx + (2\sqrt{xy} - x)dy = 0$; e) $(x-y)ydx - x^2dy = 0$;

f) $x dy - y dx = \sqrt{x^2 + y^2} dx$; g) $(4x^2 + 3xy + y^2)dx + (4y^2 + 3xy + x^2)dy = 0$.

Task 2: Solve the IVP of the homogeneous equation:

a) $(x^2 + y^2)dx - 2xydy = 0$, $y(4)=0$;

b) $(x^2 + y^2)dx - 2xydy = 0$, $y(1)=1$;

c) $(x^2 - 3y^2)dx + 2xydy = 0$, $y(2)=1$;

Task 3: Solve the Bernoulli differential equations given below:

a) $y' = \frac{4}{x}y + x\sqrt{y}$; b) $y' + \frac{y}{x} = -xy^2$; c) $2xyy' - y^2 + x = 0$;

d) $ydx + \left(x - \frac{1}{2}x^3y\right)dy = 0$; e) $3xdy = y(1 + x \sin x - 3y^3 \sin x)dx$.

Task 4: Solve the IVP of the Bernoulli equations:

a) $y' - 9x^2y = (x^5 + x^2)y^{3/2}$, $y(0)=0$ and $y(1)=2$; b) $y' - y = xy^2$, $y(0)=0$ and $y(2)=1$;

c) $xy' - y = y^2$, $y(0)=0$ and $y(1)=1$; d) $xy' + y = xy^2$, $y(0)=0$ and $y(1)=-1$.

Task 5: Solve the exact equations given below:

a) $(x+y)dx + (x+2y)dy = 0$;

b) $(x^2 + y^2 + 2x)dx + 2xydy = 0$;

c) $(x^3 - 3xy^2 + 2)dx - (3x^2y - y^2)dy = 0$.

Task 6: Find the partial solution of the exact differential equations satisfying the IVP:

a) $\frac{(x+2y)dx + ydy}{(x+y)^2} = 0$, $y(1)=3$;

b) $(x+y)dx + (x-y)dy = 0$, $y(0)=1$.

c) $(x-y)dx + (2y-x)dy = 0$, $y(1)=0$.