

1.) Use any method to solve the following differential equations. You need not solve explicitly for y .

a.) $y' = 4x^3 + \cos 4x - \sec^2 x$

b.) $y'' = 4e^{2x} + 12x - 6$

c.) $\frac{dy}{dx} = \sqrt{x} \cdot (y - 1)^2$

d.) $y' + \frac{2}{x} \cdot y = \frac{e^x}{x}$

1.) Compute z_x , z_y , and z_{xy} for $z = x^3 + \sin y + e^{xy}$.

2.) The rate at which the amount of money (\$) A in a savings account changes at time t (years) is proportional to the amount A . Initially, there is \$1000 in the account. After 5 years there is \$1500. How long will it take the account to grow to \$5000 ?

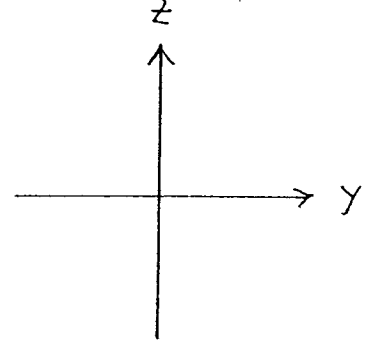
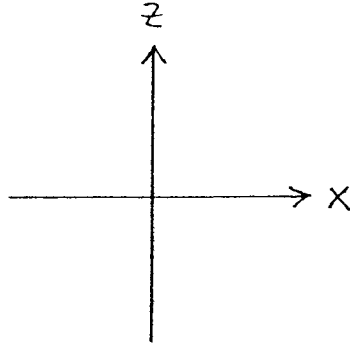
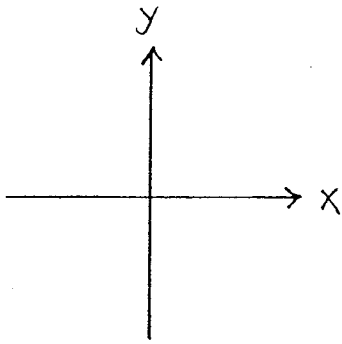
3.) (8 pts.) Show that the equation $x^2 + xy = C$ solves the differential equation $x^2 y'' - 2(x + y) = 0$.

4.) (8 pts.) Determine an equation for the sphere which has a diameter with endpoints $(-1, 0, 1)$ and $(3, 2, 0)$.

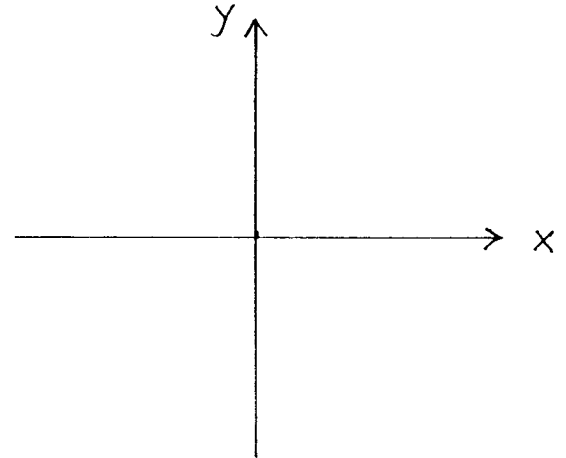
5.) Consider the equation $z = 9 - x^2 - y^2$.

a.) Determine the x -, y -, and z -intercepts for this surface.

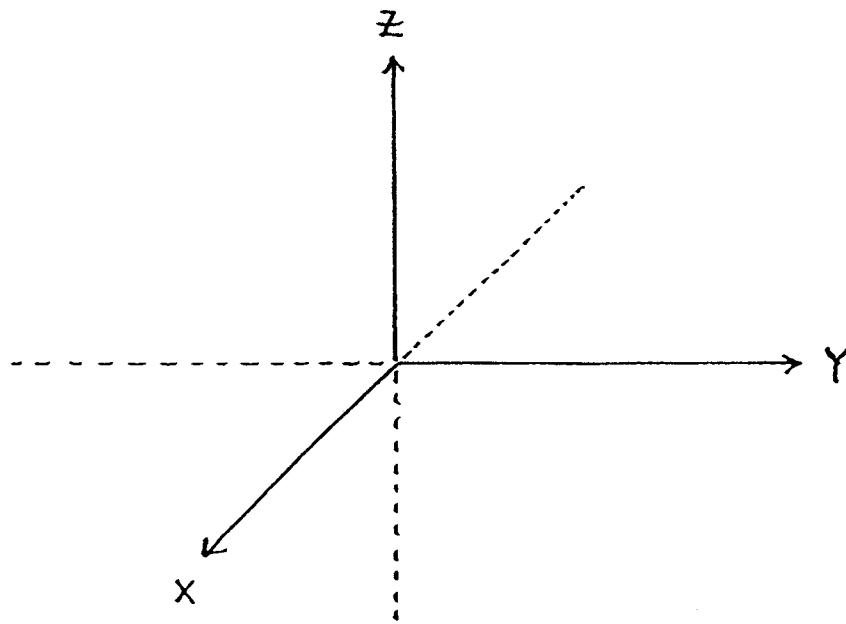
b.) (3 pts.) Determine and sketch the xy -, xz -, and yz -traces for this surface.



c.) Determine and sketch the level curves for this surface using the following values for z : 8, 5, -7.



c.) Sketch this surface in 3D-Space.



6.) Water containing 2 pounds of salt per gallon flows into a tank at the rate of 4 gal./min. and the well-stirred mixture flows out of the tank at the rate of 3 gal./min. The tank initially holds 50 gallons of water containing 10 lbs. of salt. Let S represent the number of pounds of salt in the tank at time t .

a.) Set up a differential equation which describes the rate at which the amount of salt changes at time t .

b.) Solve the differential equation in part a.). Determine all unknown constants and solve explicitly for S .