10/22/23

Second Order Equations - Constant Coefficients
Homogeneous Complex: Problem 5

$y'' + 16y = 0$

(a) $r^2 + 16 = 0$

$r^2 + 16 = 0$

$-16 \quad -16$

$r^2 = -16$

$\sqrt{r^2} = \sqrt{-16}$

$r = \pm 4i$ roots $= 4i, -4i$

general solution
$Ae\cos(4t) + Be\sin(4t)$

(b) find the particular solution with $y(0) = 9$, $y'(0) = 32$

$y = A\cos(4t) + B\sin(4t)$

$y' = -4A\sin(4t) + 4B\cos(4t)$

so, $9 = A\cos(0) + B\sin(0)$

$9 = A + 0$

$A = 9$

now find B

$32 = -4A\sin(0) + 4B\cos(0)$

$32 = -0 + 4B$

$B = \frac{32}{4} = 8$, $B = 8$

Particular solution:
$9\cos(4t) + 8\sin(4t)$