$\boxed{\text{Katz 7.25}}$ Solve $N \equiv 0 \mod 3$
$N \equiv 1 \mod 4$.

Answer: $\boxed{\text{All } N \equiv 9 \mod 12}$

(OK if just one such N is given)

(Systematically: to solve $3x = 4y+1$ in $\mathbb{Z}_+$, use Euclid's algorithm, but clearly $x=-1, y=-1$ works $\rightsquigarrow$ $N=-3$ is a solution, and all sol'ns differ from this one by a multiple of ~~12~~ $12 = 3\cdot 4$).

$\boxed{\text{Katz 7.26}}$ Solve
$N \equiv 0 \mod 11$
$N \equiv 0 \mod 5$
$N \equiv 0 \mod 7$
$N \equiv 4 \mod 9$
$N \equiv 6 \mod 8$.

Note that the first 3 equations are equivalent to $N \equiv 0 \mod \underbrace{(5\cdot 7\cdot 11)}_{385}$

so we instead treat the system
$N \equiv 0 \mod 385$
$N \equiv 4 \mod 9$
$N \equiv 6 \mod 8$

Find N_1 such that $\begin{cases} N_1 \equiv 1 \mod 9 \\ \quad\; 0 \mod 8 \\ \quad\; 0 \mod 385 \end{cases}$ by solving $\frac{385\cdot 8\cdot \cancel{9}}{\cancel{9}} \cdot x_1 \equiv 1 \mod 9$,

ie $2x_1 \equiv 1 \mod 9$. So $\boxed{x_1 \equiv 5 \mod 9}$

Find N_2 s.t. $\begin{cases} N_2 \equiv 1 \mod 8 \\ \quad\; 0 \mod 9 \\ \quad\; 0 \mod 385 \end{cases}$ by solving $\frac{385\cdot 9\cdot \cancel{8}}{\cancel{8}} x_2 \equiv 1 \mod 8$,

ie $x_2 \equiv 1 \mod 8$

Then $N_1 = 385\cdot 8\cdot 5$
$N_2 = 385\cdot 9\cdot 1$, and $N = 4N_1 + 6N_2 = 82{,}390$ works,

ie $\boxed{N \equiv 26{,}950 \mod \underbrace{27{,}720}_{= 5\cdot 7\cdot 8\cdot 9\cdot 11} \text{ gives all solutions}}$

(again, just giving one answer is OK)

(3010 PSet 3 ct'd)