Algorithm: The summary of equations for the solution of transient problems, considering spatial effects. The equation numbers are from reference [1].

Boundary	**geometry**	**Temperature distribution**	q_s'' **or** q^*	Q/Q_0
$T_s = cte$	**Semi-infinite**	(5.60)	Table 5.2a	← Integrate
	interior	Fo < 0.2: †, Fo ≥ 0.2: Table 5.2c		Fo < 0.2: ← Integrate, Fo ≥ 0.2: Table 5.2c
	exterior	Fo < 0.2: †, Fo ≥ 0.2: ?		← Integrate
$q_s'' = cte$	**Semi-infinite**	(5.62)	Table 5.2b	$q_s'' t/Q_0$
	interior	Fo < 0.2: †, Fo ≥ 0.2: ?		
	exterior	Fo < 0.2: †, Fo ≥ 0.2: ?		
h, T_∞	**Semi-infinite**	Table 5.2c	Table 5.2c	Table 5.2c
	interior	Fo < 0.2: †, Fo ≥ 0.2: Table 5.2c	Fo < 0.2: †, Fo ≥ 0.2: Table 5.2c	Fo < 0.2: ← Integrate, Fo ≥ 0.2: Table 5.2c
	exterior	Fo < 0.2: †, Fo ≥ 0.2: ?	Fo < 0.2: †, Fo ≥ 0.2: ?	Fo < 0.2: ← Integrate, Fo ≥ 0.2: ?

† indicates approximation with the semi-infinite solution for Fo < 0.2 where no approximate correlation is available.

TABLE 5.2a Summary of transient heat transfer results for constant surface temperature cases[a] [8]

Geometry	Length Scale, L_c	$q^*(Fo)$ Exact Solutions	Approximate Solutions $Fo < 0.2$	Approximate Solutions $Fo \geq 0.2$	Maximum Error (%)
Semi-infinite	L (arbitrary)	$\frac{1}{\sqrt{\pi Fo}}$	Use exact solution.		None
Interior Cases					
Plane wall of thickness $2L$	L	$2\sum_{n=1}^{\infty}\exp(-\zeta_n^2 Fo)$ $\zeta_n = (n-\frac{1}{2})\pi$	$\frac{1}{\sqrt{\pi Fo}}$	$2\exp(-\zeta_1^2 Fo)$ $\zeta_1 = \pi/2$	1.7
Infinite cylinder	r_o	$2\sum_{n=1}^{\infty}\exp(-\zeta_n^2 Fo)$ $J_0(\zeta_n) = 0$	$\frac{1}{\sqrt{\pi Fo}} - 0.50 - 0.65\,Fo$	$2\exp(-\zeta_1^2 Fo)$ $\zeta_1 = 2.4050$	0.8

... see reference [1] for the rest of the table.

TABLE 5.2b Summary of transient heat transfer results for constant surface heat flux cases[a] [8]

Geometry	Length Scale, L_c	$q^*(Fo)$ Exact Solutions		Approximate Solutions $Fo < 0.2$	Approximate Solutions $Fo \geq 0.2$	Maximum Error (%)
Semi-infinite	L (arbitrary)	$\frac{1}{2}\sqrt{\frac{\pi}{Fo}}$		Use exact solution.		None
Interior Cases						
Plane wall of thickness $2L$	L	$\left[Fo + \frac{1}{3} - 2\sum_{n=1}^{\infty}\frac{\exp(-\zeta_n^2 Fo)}{\zeta_n^2}\right]^{-1}$	$\zeta_n = n\pi$	$\frac{1}{2}\sqrt{\frac{\pi}{Fo}}$	$\left[Fo + \frac{1}{3}\right]^{-1}$	5.3
Infinite cylinder	r_o	$\left[2Fo + \frac{1}{4} - 2\sum_{n=1}^{\infty}\frac{\exp(-\zeta_n^2 Fo)}{\zeta_n^2}\right]^{-1}$	$J_1(\zeta_n) = 0$	$\frac{1}{2}\sqrt{\frac{\pi}{Fo}} - \frac{\pi}{8}$	$\left[2Fo + \frac{1}{4}\right]^{-1}$	2.1
Sphere	r_o	$\left[3Fo + \frac{1}{5} - 2\sum_{n=1}^{\infty}\frac{\exp(-\zeta_n^2 Fo)}{\zeta_n^2}\right]^{-1}$	$\tan(\zeta_n) = \zeta_n$	$\frac{1}{2}\sqrt{\frac{\pi}{Fo}} - \frac{\pi}{4}$	$\left[3Fo + \frac{1}{5}\right]^{-1}$	4.5
Exterior Cases						
Sphere	r_o	$[1 - \exp(Fo)\mathrm{erfc}(Fo^{1/2})]^{-1}$		$\frac{1}{2}\sqrt{\frac{\pi}{Fo}} + \frac{\pi}{4}$	$\frac{0.77}{\sqrt{Fo}} + 1$	3.2
Various shapes (Table 4.1, cases 12–15)	$(A_s/4\pi)^{1/2}$	None		$\frac{1}{2}\sqrt{\frac{\pi}{Fo}} + \frac{\pi}{4}$	$\frac{0.77}{\sqrt{Fo}} + q_{ss}^*$	Unknown

[a] $q^* \equiv q_s'' L_c / k(T_s - T_i)$ and $Fo \equiv \alpha t / L_c^2$, where L_c is the length scale given in the table, T_s is the object surface temperature, and T_i is (a) the initial object temperature for the interior cases and (b) the temperature of the infinite medium for the exterior cases.

Table 5.2c: Summary of transient heat transfer results for convective boundary condition. Note: for constant surface temperature cases, set $(h \to \infty, T_\infty = T_s, Bi \to \infty)$.

	L_c	Temperature distribution		q_s'' or q^*		Q/Q_0		Note
Geometry		**Exact solution**	**Approximation**	**Exact solution**	**Approximation**	**Exact solution**	**Approximation**	
Semi-infinite	L (arbitrary)	(5.63) Or Figure 5.8	Use exact solution	$h(T_\infty - T(0,t))$	Use exact solution	← Integrate	Use exact solution	
interior								
Plane wall of thickness $2L$	L	(5.42) ζ_n =?	(Fo ≥ 0.2) (5.43) + Table 5.1 Or Figure 5S.1 and 5S.2	← Differentiate	← Differentiate	← Integrate	(Fo ≥ 0.2) (5.49) Or Figure 5S.3	
Infinite cylinder	r_o	(5.50) ζ_n =?	(Fo ≥ 0.2) (5.52) + Table 5.1 Or Figure 5S.4 and 5S.5	← Differentiate	← Differentiate	← Integrate	(Fo ≥ 0.2) (5.54) Or Figure 5S.6	
sphere	r_o	(5.51) ζ_n =?	(Fo ≥ 0.2) (5.53) + Table 5.1 Or Figure 5S.7 and 5S.8	← Differentiate	← Differentiate	← Integrate	(Fo ≥ 0.2) (5.55) Or Figure 5S.9	

$q^* = q_s'' L_c/(k(T_s - T_i))$, $\mathrm{Fo} = \alpha t/L_c^2$, $\mathrm{Bi} = hL_c/k$ and where L_c is the length scale given in the table, T_s is the object surface temperature, and T_i is (a) the initial object temperature for the interior cases and (b) the temperature of the infinite medium for the exterior cases.