

From: jwjones4@pacbell.net
To: [Bennett, Jim](#)
Subject: Re: Erf large u approx
Date: Thursday, August 01, 2013 10:31:16 AM

its not so bad....

$$\text{drawdown} = Q/(4 \pi T) * W(u)$$

$$u = r^2 S/(4 T t)$$

use 10 series expansion for $u < 0.5$

use 'new' expansion for $u > .5$

calculate $W(u)$ both ways, then pick one with excel if function

$$=if(u > 0.5, Wu(new), Wu(std))$$

for stepwise pumping, like recovery

$$\text{drawdown}(t,r) = Q/(4 \pi T) * W(u) + -Q/(4 \pi T) * W(u')$$

u starts at $t=0$

u' starts at pump shutdown or change in pumping

if you drop the flow rate, say from 60 to 2 gpm, the $-Q$ is -58 gpm

for full recovery $-Q$ is -160 gpm

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From: [Bennett, Jim](#)
Sent: Thursday, August 01, 2013 9:55 AM
To: jwjones4@pacbell.net
Subject: RE: Erf large u approx

Thanks Jay! Now to figure it out!

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From: jwjones4@pacbell.net [mailto:jwjones4@pacbell.net]
Sent: Wednesday, July 31, 2013 4:40 PM
To: Bennett, Jim
Subject: Erf large u approx

Jim,

Here's the approximation for $u > 1$. see attached. its instructive to compare the behavior of the three calculations near $u = 0.1$

>copy of formula from Math Function handbook (Abramowitz and Stegun, 1970)

>table showing erf calc, eqn 5.1.56 (eqn 5.1.53 is the one we see used in the Jacob approx.)

>old spreadsheet where I ran both calculations, checked u value, then picked the function to use. crude, I'd suggest doing the same but with an IF function based on u

should plug in fairly easily...have fun!

Jay

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