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## 3.

## Two sample t-statistic

1/1 point (graded) Let

$$\bullet \ X_1,\ldots,X_n \overset{ ext{iid}}{\sim} N\left(\mu_0,\sigma_0^2
ight)$$

• 
$$Y_1,\ldots,Y_m \overset{ ext{iid}}{\sim} N\left(\mu_1,\sigma_1^2
ight)$$

• the  $X_i$ 's are independent of the  $Y_i$ 's,

where  $\mu_0, \mu_1, \sigma_0^2, \sigma_1^2$  are **unknown** parameters.

What is the two-sample t-statistic  $T_{n.m}$ ?

$$O\left(\overline{X}_{n}-\overline{Y}_{m}
ight)\sqrt{\left(\widehat{\sigma_{1}}^{2}+\widehat{\sigma_{0}}^{2}
ight)/\left(m+n
ight)}$$

$$ullet rac{\overline{X}_n - \overline{Y}_m}{\sqrt{\widehat{\sigma_1^2}/m + \widehat{\sigma_0^2}/n}}$$

$$rac{\overline{X}_n - \overline{Y}_m}{\sqrt{\sigma_1^2/m + \sigma_0^2/m}}$$

$$rac{\overline{X}_n - \overline{Y}_m}{\sqrt{\sigma_1^2 + \sigma_0^2}/\left(m+n
ight)}$$

igcup The t-statistic cannot be defined for two samples.



Submit

You have used 1 of 3 attempts

• Answers are displayed within the problem

## Distribution of t-statistic with Small Sample Size

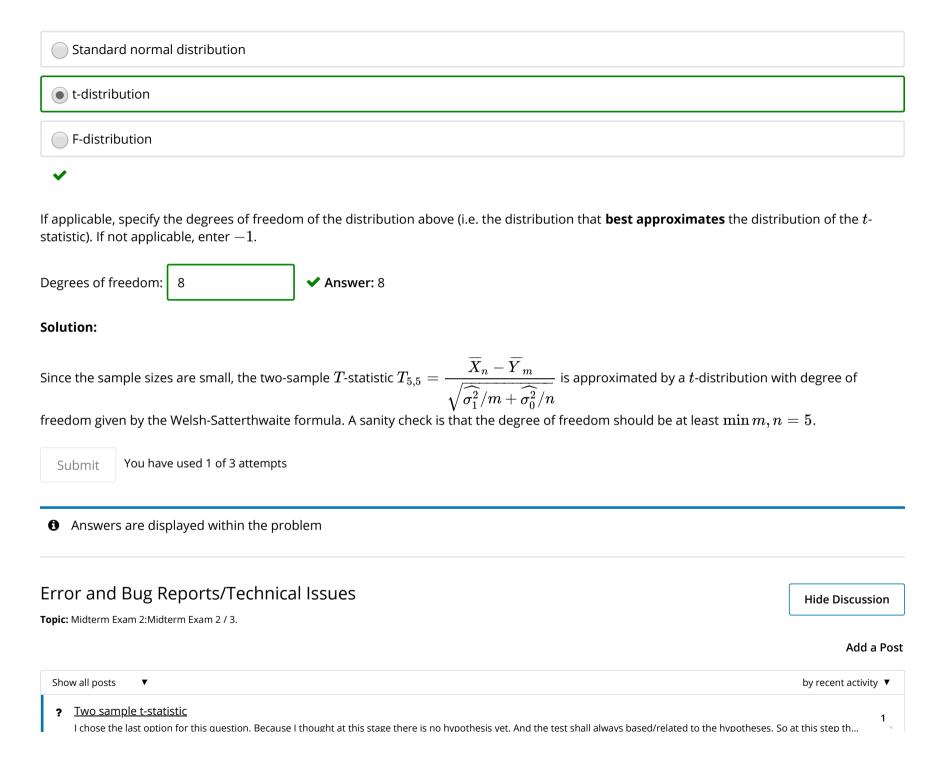
2/2 points (graded)

Continuing with the setup as above, suppose the data you collected are summarized as follows:

- Sample sizes: n=m=5;
- ullet Sample means:  $\overline{X}_n=1.2$  ,  $\overline{Y}_m=1.0$  ;
- ullet Sample variances:  $\widehat{\sigma_1^2} = \widehat{\sigma_2^2} = 0.5$ .

Which of the following distributions **best approximates** the distribution of the t-statistic  $T_{n=5,m=5}$  under the null hypothesis  $H_0: \mu_0 = \mu_1$ ?

igcup Normal distribution with mean  $\mu 
eq 0$ 



l		
2	[Res] Degrees of freedom [note: unverified result, could be wrong] To "test" my answer of 8, I implemented the WelchSatterthwaite Formula (not really needed in this case, as n is equal to m): WelchSat	4
Q	[Polling] What are your answers for this page?  1) 2nd choice 2) t-dist 3) 8	9
2	[NOTE FROM STAFF] Last problem on this page small typo  Staff	1
2	[Staff] Typo in Deleted by MW-CTA Deleted by MW-CTA	3
?	[Staff]: you have an error in your sigma squared subscripts in the last question  Hi, There is an error in your variance subscripts, these should be 0 and 1; there is no subscript 2. Not that it matters for the solutions since you made them equal; but would b	2
2	[staff]issue with the problem	4
2	[Edited by staff to remove exam content] [Edited by staff to remove exam content].	3

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