December 10, 2024

Semester Review Day 3

17

Pull out common factors

$$\frac{4(2x-5)^{3-2}(3x^2+1)^{-2/3} - 6(2x-5)^2(3x^2+1)^{1/3+\frac{2}{3}}}{(3x^2+1)^{1/3}}$$

$$\frac{2\cdot(2x-5)^2\cdot\cancel{(3x^2+1)^{-2/3}}\left[2(2x-5) - 3(3x^2+1)^1\right]}{(3x^2+1)^{1/3+2/3}}$$

$$= \frac{2(2x-5)^2\left[4x-10-9x^2-3\right]}{3x^2+1}$$

$$= \frac{2(2x-5)^2(-9x^2+4x-13)}{3x^2+1}$$

OR $$\frac{-2(2x-5)^2(9x^2-4x+13)}{(3x^2+1)}$$

$\ln_e e^7 = 7$

$\log_3 9 = \log_3 3^2 = 2$

$\log_8 \sqrt[3]{64} = \log_8 \sqrt[3]{8^2} = \log_8 8^{2/3} = \frac{2}{3}$

$\log_9 \frac{1}{81} = \log_9 \frac{1}{9^2} = \log_9 9^{-2} = -2$

Properties of Logs

$\log_b m + \log_b n = \log_b (mn)$

$\log_b m - \log_b n = \log_b \left(\frac{m}{n}\right)$

$\log_b m^p = p \log_b m$

Exponent!

Make common bases

$\log_{\frac{1}{3}} \sqrt[5]{27} = x$

$\sqrt[5]{27} = \frac{1}{3}^x$

$\sqrt[5]{3^3} = 3^{-1x}$

$3^{\frac{3}{5}} = 3^{-x}$

$\frac{3}{5} = -x$

$-\frac{3}{5} = x$

$\ln_e (3x+7) = 4$

$e^{\ln(3x+7)} = e^4$

$3x+7 = e^4$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{e^4 - 7}{3}$

f) $\ln(x+3) + \ln(2x) = 5$

$e^{\ln(2x^2+6x)} = e^5$

$2x^2 + 6x = e^5$

Quadr. formula!

$2x^2 + 6x - e^5 = 0$

$x = \frac{-6 \pm \sqrt{36 - 4(2)(-e^5)}}{2(2)}$

$x = \_\_\_\_, \_\_\_\_$

Check answers for log of a positive number.

Like h

$e^{2x} - 3e^x - 10 = 0$

Factor!

$(e^x - 5)(e^x + 2) = 0$

$e^x - 5 = 0 \quad e^x + 2 = 0$

$\ln e^x = \ln 5 \quad \ln e^x = \cancel{\ln -2}$

$x = \ln 5$

APPLICATIONS OF LOGS

A farmer purchases a new combine for $500,000. Its value decreases at 15% per year. When will its value have dropped to $200,000?

$$N = N_0(1 \pm r)^t$$

$$200{,}000 = 500{,}000(1-0.15)^t$$

$$\frac{\cancel{200{,}000}}{\cancel{500{,}000}} = \frac{500{,}000(0.85)^t}{500{,}000}$$

$$\log 0.4 = \log 0.85^t$$

$$\frac{\log(0.4)}{\log(0.85)} = \frac{t\log(0.85)}{\log(0.85)}$$

$$?\ \text{yrs.} = t$$

St. Dev.

1) Find mean.
2) Data − mean
3) Square ~~difference~~
4) Find mean of squares
5) $\sqrt{}$

Outliers

IQR * 1.5 = #

Lower boundary = $Q_1 - \#$

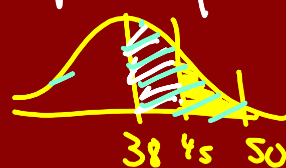
Upper boundary = $Q_3 + \#$

population data — Normal Distribution

$$z = \frac{x - \mu}{\sigma}$$

The number of text messages sent by 800 teens at Chaparral HS is normally distributed with a mean of 38 + a st. dev of 7. How many teens send between 45 + 50 texts per day?

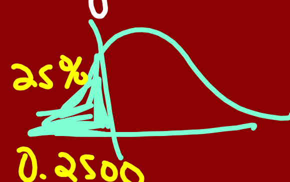
$z = \dfrac{45 - 38}{7} = \dfrac{7}{1} = 1.00$ 0.3413



$z = \dfrac{50 - 38}{7} = \dfrac{12}{7} = 1.71$ 0.4564

$$\begin{array}{r} 0.4564 \\ -\ 0.3413 \\ \hline 0.1151 \end{array} * 800 \approx 92 \text{ teens}$$

What number of text messages is the cutoff line for the lowest 25%?



= raw score

$$-0.67 = \frac{x - 38}{7}$$

Confidence Intervals = SAMPLE DATA

$\sigma_{\bar{x}} = \frac{s}{\sqrt{n}}$

$E = Z \cdot \sigma_{\bar{x}}$

$\bar{x} \pm E$

90% conf.

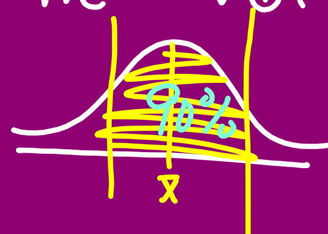
A sample of 64 families in an upper class area of L.A. found the mean amount spent for Christmas gifts per family member was \$8000 with a st. dev of \$1000. Find a 90% conf. interval.

1) Standard error $\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{1000}{\sqrt{64}} = 125$

2) $E = Z \cdot \sigma_{\bar{x}}$

$E = 1.65 \cdot 125$

$E = \$206.25$



3) $\bar{x} \pm E$ $\quad 8000 \pm 206.25$ $\quad A = 45\% = 0.4500$

$\boxed{\$7793.75 - \$8206.25}$

Hypothesis Testing

42/ $\mu = 21$ $\sigma = 4.7$

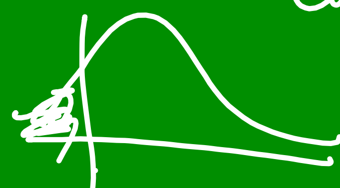
$\bar{x} = 22.4$

H_0: Trying to disprove $\mu \leq 21$

H_a: Think this happening $\mu > 21$

$p < 0.05$

prob from normal curve



One-tailed: < or >

two-tailed: $\neq$

$$\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{4.7}{\sqrt{40}} = 0.743$$

$$z^* = \frac{\bar{x} - \mu}{\sigma_{\bar{x}}}$$

$$z^* = \frac{22.4 - 21}{0.743} = \frac{1.4}{0.743}$$

$$z^* = 1.88$$

$$p = 0.0301$$

Reject H_0

NC students performed better.

PROBABILITY

Combinations
No Repl.
No Order
Dep.

Indiv.
Has Repl.
Has Order
Indep

Binomial
Indep.
2 possible outcomes

Conditional

$$P(\underset{\uparrow \text{find}}{A} \mid \underset{\uparrow \text{know}}{B}) = \frac{P(AB)}{P(B)}$$

_____ OR _____
+
Look out for overlaps

Expected Value = (prob.)(gain/loss)

Event		
Prob		
Gain/Loss		