

Warm up

1. Rewrite.

a. $x^4 = 3$

b. $e^5 = x$

c. $\log_3 x = 7$

d. $\ln x = r$

2. Evaluate

a. $\log_4 \frac{1}{16} - \log_3 81$

b. $4 \ln e^6$

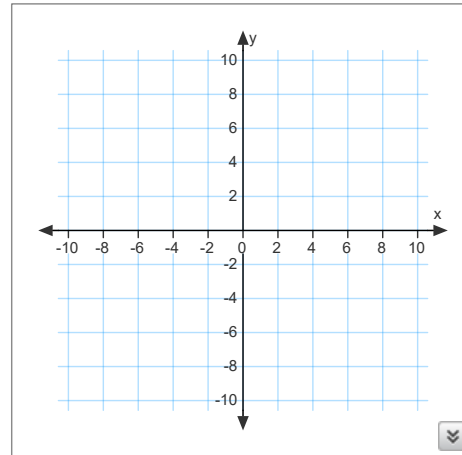
3. Solve

$x^4 - 4x^2 - 12 = 0$

3. Sketch by hand.

a. $f(x) = e^{x-1} + 3$

b. $f(x) = \log(-x) - 4$



Nov 7-6:46 AM

GO COUGARS!

Homework Questions

p.203

In Exercises 1-4, write the logarithmic equation in exponential form for each. In Exercises 5-8, write the exponential equation in logarithmic form for each.

1. $\log_2 16 = 4$ 5. $\log_3 27 = 3$
 2. $\log_5 125 = 3$ 6. $\log_4 64 = 3$
 3. $\log_7 49 = 2$ 7. $\log_9 81 = 2$
 4. $\log_{10} 100 = 2$ 8. $\log_{10} 1000 = 3$

In Exercises 9-12, write the logarithmic equation in exponential form for each. In Exercises 13-16, write the exponential equation in logarithmic form for each.

9. $\log_3 27 = 3$ 13. $2^5 = 32$
 10. $\log_5 125 = 3$ 14. $4^3 = 64$
 11. $\log_7 49 = 2$ 15. $9^2 = 81$
 12. $\log_{10} 100 = 2$ 16. $10^3 = 1000$

In Exercises 17-20, compare the function at the indicated value of x. Indicate which function is greater.

17. $f(x) = \log_2 x$ 18. $g(x) = \log_3 x$
 19. $f(x) = \log_4 x$ 20. $g(x) = \log_5 x$

In Exercises 21-24, use a calculator to evaluate the function at the indicated value of x. Round your result to three decimal places.

21. $f(x) = \log_2 10$ 22. $g(x) = \log_3 10$
 23. $f(x) = \log_4 10$ 24. $g(x) = \log_5 10$

In Exercises 25-28, solve the equation for x.

25. $\log_2 x = 3$ 26. $\log_3 x = 4$
 27. $\log_5 x = 2$ 28. $\log_7 x = 1$

In Exercises 29-32, solve the equation for x.

29. $\log_2 x = \log_2 8$ 30. $\log_3 x = \log_3 27$
 31. $\log_4 x = \log_4 16$ 32. $\log_5 x = \log_5 125$

In Exercises 33-36, solve the equation for x.

33. $\log_2 x = 5$ 34. $\log_3 x = 6$
 35. $\log_4 x = 3$ 36. $\log_5 x = 4$

In Exercises 37-40, solve the equation for x.

37. $\log_2 x = \log_2 16$ 38. $\log_3 x = \log_3 27$
 39. $\log_4 x = \log_4 64$ 40. $\log_5 x = \log_5 125$

In Exercises 41-44, solve the equation for x.

41. $\log_2 x = 3$ 42. $\log_3 x = 4$
 43. $\log_4 x = 2$ 44. $\log_5 x = 1$

In Exercises 45-48, solve the equation for x.

45. $\log_2 x = \log_2 8$ 46. $\log_3 x = \log_3 27$
 47. $\log_4 x = \log_4 16$ 48. $\log_5 x = \log_5 125$

In Exercises 49-52, solve the equation for x.

49. $\log_2 x = 5$ 50. $\log_3 x = 6$
 51. $\log_4 x = 3$ 52. $\log_5 x = 4$

In Exercises 53-56, solve the equation for x.

53. $\log_2 x = \log_2 16$ 54. $\log_3 x = \log_3 27$
 55. $\log_4 x = \log_4 64$ 56. $\log_5 x = \log_5 125$

In Exercises 57-60, solve the equation for x.

57. $\log_2 x = 3$ 58. $\log_3 x = 4$
 59. $\log_4 x = 2$ 60. $\log_5 x = 1$

In Exercises 61-64, solve the equation for x.

61. $\log_2 x = \log_2 8$ 62. $\log_3 x = \log_3 27$
 63. $\log_4 x = \log_4 16$ 64. $\log_5 x = \log_5 125$

In Exercises 65-68, solve the equation for x.

65. $\log_2 x = 5$ 66. $\log_3 x = 6$
 67. $\log_4 x = 3$ 68. $\log_5 x = 4$

In Exercises 69-72, solve the equation for x.

69. $\log_2 x = \log_2 16$ 70. $\log_3 x = \log_3 27$
 71. $\log_4 x = \log_4 64$ 72. $\log_5 x = \log_5 125$

In Exercises 73-76, solve the equation for x.

73. $\log_2 x = 3$ 74. $\log_3 x = 4$
 75. $\log_4 x = 2$ 76. $\log_5 x = 1$

In Exercises 77-80, solve the equation for x.

77. $\log_2 x = \log_2 8$ 78. $\log_3 x = \log_3 27$
 79. $\log_4 x = \log_4 16$ 80. $\log_5 x = \log_5 125$

In Exercises 81-84, solve the equation for x.

81. $\log_2 x = 5$ 82. $\log_3 x = 6$
 83. $\log_4 x = 3$ 84. $\log_5 x = 4$

In Exercises 85-88, solve the equation for x.

85. $\log_2 x = \log_2 16$ 86. $\log_3 x = \log_3 27$
 87. $\log_4 x = \log_4 64$ 88. $\log_5 x = \log_5 125$

In Exercises 89-92, solve the equation for x.

89. $\log_2 x = 3$ 90. $\log_3 x = 4$
 91. $\log_4 x = 2$ 92. $\log_5 x = 1$

In Exercises 93-96, solve the equation for x.

93. $\log_2 x = \log_2 8$ 94. $\log_3 x = \log_3 27$
 95. $\log_4 x = \log_4 16$ 96. $\log_5 x = \log_5 125$

In Exercises 97-100, solve the equation for x.

97. $\log_2 x = 5$ 98. $\log_3 x = 6$
 99. $\log_4 x = 3$ 100. $\log_5 x = 4$

In Exercises 101-104, solve the equation for x.

101. $\log_2 x = \log_2 16$ 102. $\log_3 x = \log_3 27$
 103. $\log_4 x = \log_4 64$ 104. $\log_5 x = \log_5 125$

In Exercises 105-108, solve the equation for x.

105. $\log_2 x = 3$ 106. $\log_3 x = 4$
 107. $\log_4 x = 2$ 108. $\log_5 x = 1$

In Exercises 109-112, solve the equation for x.

109. $\log_2 x = \log_2 8$ 110. $\log_3 x = \log_3 27$
 111. $\log_4 x = \log_4 16$ 112. $\log_5 x = \log_5 125$

In Exercises 113-116, solve the equation for x.

113. $\log_2 x = 5$ 114. $\log_3 x = 6$
 115. $\log_4 x = 3$ 116. $\log_5 x = 4$

In Exercises 117-120, solve the equation for x.

117. $\log_2 x = \log_2 16$ 118. $\log_3 x = \log_3 27$
 119. $\log_4 x = \log_4 64$ 120. $\log_5 x = \log_5 125$

In Exercises 121-124, solve the equation for x.

121. $\log_2 x = 3$ 122. $\log_3 x = 4$
 123. $\log_4 x = 2$ 124. $\log_5 x = 1$

In Exercises 125-128, solve the equation for x.

125. $\log_2 x = \log_2 8$ 126. $\log_3 x = \log_3 27$
 127. $\log_4 x = \log_4 16$ 128. $\log_5 x = \log_5 125$

In Exercises 129-132, solve the equation for x.

129. $\log_2 x = 5$ 130. $\log_3 x = 6$
 131. $\log_4 x = 3$ 132. $\log_5 x = 4$

In Exercises 133-136, solve the equation for x.

133. $\log_2 x = \log_2 16$ 134. $\log_3 x = \log_3 27$
 135. $\log_4 x = \log_4 64$ 136. $\log_5 x = \log_5 125$

In Exercises 137-140, solve the equation for x.

137. $\log_2 x = 3$ 138. $\log_3 x = 4$
 139. $\log_4 x = 2$ 140. $\log_5 x = 1$

In Exercises 141-144, solve the equation for x.

141. $\log_2 x = \log_2 8$ 142. $\log_3 x = \log_3 27$
 143. $\log_4 x = \log_4 16$ 144. $\log_5 x = \log_5 125$

In Exercises 145-148, solve the equation for x.

145. $\log_2 x = 5$ 146. $\log_3 x = 6$
 147. $\log_4 x = 3$ 148. $\log_5 x = 4$

In Exercises 149-152, solve the equation for x.

149. $\log_2 x = \log_2 16$ 150. $\log_3 x = \log_3 27$
 151. $\log_4 x = \log_4 64$ 152. $\log_5 x = \log_5 125$

In Exercises 153-156, solve the equation for x.

153. $\log_2 x = 3$ 154. $\log_3 x = 4$
 155. $\log_4 x = 2$ 156. $\log_5 x = 1$

In Exercises 157-160, solve the equation for x.

157. $\log_2 x = \log_2 8$ 158. $\log_3 x = \log_3 27$
 159. $\log_4 x = \log_4 16$ 160. $\log_5 x = \log_5 125$

In Exercises 161-164, solve the equation for x.

161. $\log_2 x = 5$ 162. $\log_3 x = 6$
 163. $\log_4 x = 3$ 164. $\log_5 x = 4$

In Exercises 165-168, solve the equation for x.

165. $\log_2 x = \log_2 16$ 166. $\log_3 x = \log_3 27$
 167. $\log_4 x = \log_4 64$ 168. $\log_5 x = \log_5 125$

In Exercises 169-172, solve the equation for x.

169. $\log_2 x = 3$ 170. $\log_3 x = 4$
 171. $\log_4 x = 2$ 172. $\log_5 x = 1$

In Exercises 173-176, solve the equation for x.

173. $\log_2 x = \log_2 8$ 174. $\log_3 x = \log_3 27$
 175. $\log_4 x = \log_4 16$ 176. $\log_5 x = \log_5 125$

In Exercises 177-180, solve the equation for x.

177. $\log_2 x = 5$ 178. $\log_3 x = 6$
 179. $\log_4 x = 3$ 180. $\log_5 x = 4$

In Exercises 181-184, solve the equation for x.

181. $\log_2 x = \log_2 16$ 182. $\log_3 x = \log_3 27$
 183. $\log_4 x = \log_4 64$ 184. $\log_5 x = \log_5 125$

In Exercises 185-188, solve the equation for x.

185. $\log_2 x = 3$ 186. $\log_3 x = 4$
 187. $\log_4 x = 2$ 188. $\log_5 x = 1$

In Exercises 189-192, solve the equation for x.

189. $\log_2 x = \log_2 8$ 190. $\log_3 x = \log_3 27$
 191. $\log_4 x = \log_4 16$ 192. $\log_5 x = \log_5 125$

In Exercises 193-196, solve the equation for x.

193. $\log_2 x = 5$ 194. $\log_3 x = 6$
 195. $\log_4 x = 3$ 196. $\log_5 x = 4$

In Exercises 197-200, solve the equation for x.

197. $\log_2 x = \log_2 16$ 198. $\log_3 x = \log_3 27$
 199. $\log_4 x = \log_4 64$ 200. $\log_5 x = \log_5 125$

In Exercises 201-204, solve the equation for x.

201. $\log_2 x = 3$ 202. $\log_3 x = 4$
 203. $\log_4 x = 2$ 204. $\log_5 x = 1$

In Exercises 205-208, solve the equation for x.

205. $\log_2 x = \log_2 8$ 206. $\log_3 x = \log_3 27$
 207. $\log_4 x = \log_4 16$ 208. $\log_5 x = \log_5 125$

In Exercises 209-212, solve the equation for x.

209. $\log_2 x = 5$ 210. $\log_3 x = 6$
 211. $\log_4 x = 3$ 212. $\log_5 x = 4$

In Exercises 213-216, solve the equation for x.

213. $\log_2 x = \log_2 16$ 214. $\log_3 x = \log_3 27$
 215. $\log_4 x = \log_4 64$ 216. $\log_5 x = \log_5 125$

In Exercises 217-220, solve the equation for x.

217. $\log_2 x = 3$ 218. $\log_3 x = 4$
 219. $\log_4 x = 2$ 220. $\log_5 x = 1$

In Exercises 221-224, solve the equation for x.

221. $\log_2 x = \log_2 8$ 222. $\log_3 x = \log_3 27$
 223. $\log_4 x = \log_4 16$ 224. $\log_5 x = \log_5 125$

In Exercises 225-228, solve the equation for x.

225. $\log_2 x = 5$ 226. $\log_3 x = 6$
 227. $\log_4 x = 3$ 228. $\log_5 x = 4$

In Exercises 229-232, solve the equation for x.

229. $\log_2 x = \log_2 16$ 230. $\log_3 x = \log_3 27$
 231. $\log_4 x = \log_4 64$ 232. $\log_5 x = \log_5 125$

In Exercises 233-236, solve the equation for x.

233. $\log_2 x = 3$ 234. $\log_3 x = 4$
 235. $\log_4 x = 2$ 236. $\log_5 x = 1$

In Exercises 237-240, solve the equation for x.

237. $\log_2 x = \log_2 8$ 238. $\log_3 x = \log_3 27$
 239. $\log_4 x = \log_4 16$ 240. $\log_5 x = \log_5 125$

In Exercises 241-244, solve the equation for x.

241. $\log_2 x = 5$ 242. $\log_3 x = 6$
 243. $\log_4 x = 3$ 244. $\log_5 x = 4$

In Exercises 245-248, solve the equation for x.

245. $\log_2 x = \log_2 16$ 246. $\log_3 x = \log_3 27$
 247. $\log_4 x = \log_4 64$ 248. $\log_5 x = \log_5 125$

In Exercises 249-252, solve the equation for x.

249. $\log_2 x = 3$ 250. $\log_3 x = 4$
 251. $\log_4 x = 2$ 252. $\log_5 x = 1$

In Exercises 253-256, solve the equation for x.

253. $\log_2 x = \log_2 8$ 254. $\log_3 x = \log_3 27$
 255. $\log_4 x = \log_4 16$ 256. $\log_5 x = \log_5 125$

In Exercises 257-260, solve the equation for x.

257. $\log_2 x = 5$ 258. $\log_3 x = 6$
 259. $\log_4 x = 3$ 260. $\log_5 x = 4$

In Exercises 261-264, solve the equation for x.

261. $\log_2 x = \log_2 16$ 262. $\log_3 x = \log_3 27$
 263. $\log_4 x = \log_4 64$ 264. $\log_5 x = \log_5 125$

In Exercises 265-268, solve the equation for x.

265. $\log_2 x = 3$ 266. $\log_3 x = 4$
 267. $\log_4 x = 2$ 268. $\log_5 x = 1$

In Exercises 269-272, solve the equation for x.

269. $\log_2 x = \log_2 8$ 270. $\log_3 x = \log_3 27$
 271. $\log_4 x = \log_4 16$ 272. $\log_5 x = \log_5 125$

In Exercises 273-276, solve the equation for x.

273. $\log_2 x = 5$ 274. $\log_3 x = 6$
 275. $\log_4 x = 3$ 276. $\log_5 x = 4$

In Exercises 277-280, solve the equation for x.

277. $\log_2 x = \log_2 16$ 278. $\log_3 x = \log_3 27$
 279. $\log_4 x = \log_4 64$ 280. $\log_5 x = \log_5 125$

In Exercises 281-284, solve the equation for x.

281. $\log_2 x = 3$ 282. $\log_3 x = 4$
 283. $\log_4 x = 2$ 284. $\log_5 x = 1$

In Exercises 285-288, solve the equation for x.

285. $\log_2 x = \log_2 8$ 286. $\log_3 x = \log_3 27$
 287. $\log_4 x = \log_4 16$ 288. $\log_5 x = \log_5 125$

In Exercises 289-292, solve the equation for x.

289. $\log_2 x = 5$ 290. $\log_3 x = 6$
 291. $\log_4 x = 3$ 292. $\log_5 x = 4$

In Exercises 293-296, solve the equation for x.

293. $\log_2 x = \log_2 16$ 294. $\log_3 x = \log_3 27$
 295. $\log_4 x = \log_4 64$ 296. $\log_5 x = \log_5 125$

In Exercises 297-300, solve the equation for x.

297. $\log_2 x = 3$ 298. $\log_3 x = 4$
 299. $\log_4 x = 2$ 300. $\log_5 x = 1$

In Exercises 301-304, solve the equation for x.

301. $\log_2 x = \log_2 8$ 302. $\log_3 x = \log_3 27$
 303. $\log_4 x = \log_4 16$ 304. $\log_5 x = \log_5 125$

In Exercises 305-308, solve the equation for x.

305. $\log_2 x = 5$ 306. $\log_3 x = 6$
 307. $\log_4 x = 3$ 308. $\log_5 x = 4$

In Exercises 309-312, solve the equation for x.

309. $\log_2 x = \log_2 16$ 310. $\log_3 x = \log_3 27$
 311. $\log_4 x = \log_4 64$ 312. $\log_5 x = \log_5 125$

In Exercises 313-316, solve the equation for x.

313. $\log_2 x = 3$ 314. $\log_3 x = 4$
 315. $\log_4 x = 2$ 316. $\log_5 x = 1$

In Exercises 317-320, solve the equation for x.

317. $\log_2 x = \log_2 8$ 318. $\log_3 x = \log_3 27$
 319. $\log_4 x = \log_4 16$ 320. $\log_5 x = \log_5 125$

In Exercises 321-324, solve the equation for x.

321. $\log_2 x = 5$ 322. $\log_3 x = 6$
 323. $\log_4 x = 3$ 324. $\log_5 x = 4$

In Exercises 325-328, solve the equation for x.

325. $\log_2 x = \log_2 16$ 326. $\log_3 x = \log_3 27$
 327. $\log_4 x = \log_4 64$ 328. $\log_5 x = \log_5 125$

In Exercises 329-332, solve the equation for x.

329. $\log_2 x = 3$ 330. $\log_3 x = 4$
 331. $\log_4 x = 2$ 332. $\log_5 x = 1$

In Exercises 333-336, solve the equation for x.

333. $\log_2 x = \log_2 8$ 334. $\log_3 x = \log_3 27$
 335. $\log_4 x = \log_4 16$ 336. $\log_5 x = \log_5 125$

In Exercises 337-340, solve the equation for x.

337. $\log_2 x = 5$ 338. $\log_3 x = 6$
 339. $\log_4 x = 3$ 340. $\log_5 x = 4$

In Exercises 341-344, solve the equation for x.

341. $\log_2 x = \log_2 16$ 342. $\log_3 x = \log_3 27$
 343. $\log_4 x = \log_4 64$ 344. $\log_5 x = \log_5 125$

In Exercises 345-348, solve the equation for x.

345. $\log_2 x = 3$ 346. $\log_3 x = 4$
 347. $\log_4 x = 2$ 348. $\log_5 x = 1$

In Exercises 349-352, solve the equation for x.

349. $\log_2 x = \log_2 8$ 350. $\log_3 x = \log_3 27$
 351. $\log_4 x = \log_4 16$ 352. $\log_5 x = \log_5 125$

In Exercises 353-356, solve the equation for x.

353. $\log_2 x = 5$ 354. $\log_3 x = 6$
 355. $\log_4 x = 3$ 356. $\log_5 x = 4$

In Exercises 357-360, solve the equation for x.

357. $\log_2 x = \log_2 16$ 358. $\log_3 x = \log_3 27$
 359. $\log_4 x = \log_4 64$ 360. $\log_5 x = \log_5 125$

In Exercises 361-364, solve the equation for x.

361. $\log_2 x = 3$ 362. $\log_3 x = 4$
 363. $\log_4 x = 2$ 364. $\log_5 x = 1$

In Exercises 365-368, solve the equation for x.

365. $\log_2 x = \log_2 8$ 366. $\log_3 x = \log_3 27$
 367. $\log_4 x = \log_4 16$ 368. $\log_5 x = \log_5 125$

In Exercises 369-372, solve the equation for x.

369. $\log_2 x = 5$ 370. $\log_3 x = 6$
 371. $\log_4 x = 3$ 372. $\log_5 x = 4$

In Exercises 373-376, solve the equation for x.

373. $\log_2 x = \log_2 16$ 374. $\log_3 x = \log_3 27$
 375. $\log_4 x = \log_4 64$ 376. $\log_5 x = \log_5 125$

In Exercises 377-380, solve the equation for x.

377. $\log_2 x = 3$ 378. $\log_3 x = 4$
 379. $\log_4 x = 2$ 380. $\log_5 x = 1$

In Exercises 381-384, solve the equation for x.

381. $\log_2 x = \log_2 8$ 382. $\log_3 x = \log_3 27$
 383. $\log_4 x = \log_4 16$ 384. $\log_5 x = \log_5 125$

In Exercises 385-388, solve the equation for x.

385. $\log_2 x = 5$ 386. $\log_3 x = 6$
 387. $\log_4 x = 3$ 388. $\log_5 x = 4$

In Exercises 389-392, solve the equation for x.

389. $\log_2 x = \log_2 16$ 390. $\log_3 x = \log_3 27$
 391. $\log_4 x = \log_4 64$ 392. $\log_5 x = \log_5 125$

In Exercises 393-396, solve the equation for x.

393. $\log_2 x = 3$ 394. $\log_3 x = 4$
 395. $\log_4 x = 2$ 396. $\log_5 x = 1$

In Exercises 397-400, solve the equation for x.

397. $\log_2 x = \log_2 8$ 398. $\log_3 x = \log_3 27$
 399. $\log_4 x = \log_4 16$ 400. $\log_5 x = \log_5 125$

In Exercises 401-404, solve the equation for x.

401. $\log_2 x = 5$

3.4 Solving Equations Day 1

Matching bases

Exponential

Oct 25-12:08 PM

Solve

$$5^x = 125$$

$$5^x = 5^3$$

$$x = 3$$

$$\left(\frac{1}{2}\right)^x = 8$$

$$(2^{-1})^x = 8$$

$$2^{-x} = 2^3$$

$$-x = 3$$

$$x = -3$$

$$9^{x+1} = 27$$

$$(3^2)^{x+1} = 3^3$$

$$3^{2x+2} = 3^3$$

$$2x+2 = 3$$

$$2x = 1$$

$$x = \frac{1}{2}$$

Oct 25-12:09 PM

To solve other Exponential Equations
change exp \longrightarrow log

$$\frac{5(3^x)}{5} = \frac{35}{5}$$

$$3^x = 7$$

$$\log_3 7 = x$$

$$\frac{\log 7}{\log 3}$$

$$1.77$$

- ① Isolate the term with the variable
- ② Rewrite as a log problem to 'untrap' the x
- ③ Simplify using change of base

$$\log 3^x = \log 7$$

$$x \log 3 = \frac{\log 7}{\log 3}$$

$$x = \frac{\log 7}{\log 3}$$

$$= 1.77$$

$$3^x = 7$$

$$\log_3 3^x = \log_3 7$$

$$x = \log_3 7$$

$$x = \frac{\log 7}{\log 3}$$

Oct 25-12:10 PM

$$4 + 2e^{3x} = 9$$

-4

-4

$$\frac{2e^{3x}}{2} = \frac{5}{2}$$

$$e^{3x} = \frac{5}{2}$$

$$\ln \frac{5}{2} = \frac{3x}{3}$$

$$.305 = x$$

OR

$$\ln e^{3x} = \ln \frac{5}{2}$$

$$\frac{3x}{3} = \ln \frac{5}{2}$$

$$6(2^{4x-1}) - 5 = 19$$

$$\frac{6(2^{4x-1})}{6} = \frac{24}{6}$$

~~$$\frac{2^{4x-1}}{2} = 4$$~~

can't divide by the base

$$2^{4x-1} = 2^2$$

$$4x-1=2$$

$$x = \frac{3}{4}$$

Oct 25-12:13 PM

$$e^{2x} - 4e^x + 3 = 0$$

quadratic!

$$(e^x)^2 - 4e^x + 3 = 0$$

$$(e^x - 3)(e^x - 1) = 0$$

$\frac{3}{-4} \Rightarrow -3, -1$

$$\frac{e^x = 3 \mid e^x = 1}{3^x = 4^{x-1}} \rightarrow \begin{array}{l} \ln 3 = x \\ 1.1 = x \end{array} \quad \begin{array}{l} \ln 1 = x \\ 0 = x \end{array}$$

$$\log 3^x = \log 4^{x-1}$$

$$x \log 3 = (x-1) \log 4$$

$$x \log 3 = x \log 4 - \log 4$$

$$x \log 3 - x \log 4 = -\log 4$$

$$x(\log 3 - \log 4) = -\log 4$$

$$x = \frac{-\log 4}{\log 3 - \log 4}$$

$$x = 4.82$$

Oct 25-12:16 PM

HOMWORK



p 221 3, 11, 21-27 odd, 47-51 odd,

57-67 odd

p 206 113-123 odd

Aug 29-6:38 AM