168. Solve algebraically: $\log 2 - \log(x-1) = \log(x+1) - \log(x+17)$

JAN 2008

169. Determine an equation for the asymptote of the graph of $y = 2^{x+3} + 4$.

A. $y = 4$ B. $x = 3$ C. $x = -3$ D. $y = -4$

170. Solve: $9^x = 27^{x-3}$

A. -9 B. 3 C. $\frac{9}{2}$ D. 9

171. Solve: $\log_5(3x) - \log_5(x-3) = 2$

A. -6 B. $-\frac{1}{2}$ C. $\frac{75}{22}$ D. 11

172. Evaluate: $\log_5 \sqrt{5^3}$

A. $\frac{1}{6}$ B. $\frac{2}{3}$ C. $\frac{3}{2}$ D. 6

173. If $\log_2 5 = x$ and $\log_2 3 = y$, determine an expression for $\log_2\left(\frac{15}{2}\right)$, in terms of x and y.

A. xy B. $x+y$ C. $xy-1$ D. $x+y-1$

174. Solve: $\log_2(\log_x(x+6)) = 1$

A. 2 B. 3 C. $2, 3$ D. $-2, 3$

175. Change $\log_2(3x) = 5$ to exponential form.

A. $3x = 2^5$ B. $3x = 5^2$ C. $2 = (3x)^5$ D. $2 = 3x^5$

176. In 1872, Washington State experienced an earthquake of magnitude 6.8 on the Richter scale. Determine the magnitude on the Richter scale of an earthquake that is half as intense as the Washington State earthquake.

A. 3.4 B. 6.0 C. 6.5 D. 7.1

177. A population grows continously according to the formula $P = P_o e^{kt}$, where P is the final population at the end of t years, P_o is the initial population, and k is the annual growth rate. What will the population be at the end of 10 years if the initial population is 5000 and the annual growth rate is 3%?

A. 6 720 B. 6 749 C. 51 523 D. 100 428

178. In a population of moths, 78 moths increase to 1000 moths in 40 weeks. What is the doubling time for this population of moths?

SAMPLE 2009

179. Solve for x: $81^{x-1} = \left(\frac{1}{27}\right)^{x-4}$

A. -8 B. -3 C. $-\frac{3}{7}$ D. $\frac{16}{7}$

180. Solve for x: $9^{x+2} = (3^{4x-3})(3^5)$

A. 0 B. 1 C. $\frac{17}{19}$ D. $\frac{19}{18}$

181. Solve for x: $5 = 3^x$

A. $x = \log_5 3$ B. $x = \log_3 5$ C. $x = 3^5$ D. $x = 5^3$

182. Solve for x: $ab^x = c$

A. $x = \dfrac{\log c}{\log a + \log b}$ B. $x = \dfrac{\log c + \log a}{\log b}$

C. $x = \dfrac{\log c - \log a}{\log b}$ D. $x = \dfrac{\log c}{\log b} - \log a$

183. Solve: $2^x = 3\left(5^{x+1}\right)$

184. Solve for x: $\log(3 - x) + \log(3 + x) = \log 5$

A. $x = -2$ B. $x = 2$ C. $x = \pm 2$ D. no solution

185. Solve: $\log_2 8 + \log_3 \dfrac{1}{3} = \log_4 x$

A. $\dfrac{1}{64}$ B. $\dfrac{1}{16}$ C. 16 D. 64

186. Solve: $\log_2(\log_4(\log_5 x)) = -1$

A. $\dfrac{1}{25}$ B. 5 C. 25 D. 125

187. Solve: $2\log_4 x - \log_4(x+3) = 1$

188. Simplify: $\log_2 4^x$

A. x B. $2x$ C. 2^x D. x^2

189. Write as a single logarithm: $3 + \frac{1}{2}\log_2 x - 3\log_2 y$

A. $\log_2\left(\frac{1000\sqrt{x}}{y^3}\right)$ B. $\log_2 \frac{8\sqrt{x}}{y^3}$

C. $\log_2(1000 + \sqrt{x} - y^3)$ D. $\log_2(8 + \sqrt{x} - y^3)$

190. If $\log_4 x = a$, determine $\log_{16} x$ in terms of a .

A. $\frac{a}{4}$ B. $\frac{a}{2}$ C. $2a$ D. $4a$

191. If $\log 2 = a$, $\log 3 = b$, determine an expression for $\log 2400$.

A. $2a^3b$ B. $3a + b + 2$ C. $3a + b + 100$ D. $a^3 + b + 2$

192. Simplify: $a^{\log_a 8 + \log_a 2}$

A. 10 B. 16 C. a^{10} D. a^{16}

193. Determine the value of $\log_n ab^2$ if $\log_n a = 5$ and $\log_n b = 3$.

A. 11 B. 14 C. 16 D. 45

194. Given $\log_a 2 = x$ and $(\log_a 8)(a^{\log_a x}) = 12$, solve for a.

A. 2 B. ± 2 C. $\sqrt{2}$ D. $\pm\sqrt{2}$

195. Change to exponential form: $\log_k l = m$

A. $l = m^k$ B. $l = k^m$ C. $k = m^l$ D. $k = l^m$

196. If (a, b) is on the graph of $y = 3^x$, which point must be on the graph of $y = \log_3 x$?

A. (a, b) B. (b, a) C. $(3a, b)$ D. $(a, 3b)$

197. Determine the inverse of $f(x) = 3^{x-1} - 2$.

A. $f^{-1}(x) = \log_3(x+2) + 1$ B. $f^{-1}(x) = \log_3(x+2) - 1$

C. $f^{-1}(x) = \log_3(x-1) + 2$ D. $f^{-1}(x) = \log_3(x-1) - 2$

198. If \$5000 is invested at 7.2% per annum compounded monthly, which equation can be used to determine the number of years, t, for the investment to increase to \$8000?

A. $8000 = 5000(1.072)^t$ B. $8000 = 5000(1.006)^t$

C. $8000 = 5000(1.072)^{12t}$ D. $8000 = 5000(1.006)^{12t}$

199. The population of a particular country is 25 million. Assuming the population is growing continuously, the population, P, in millions, t years from now can be determined by the formula $P = 25e^{0.022t}$. Determine the population, in millions, 20 years from now.

A. 29.90 B. 37.97 C. 38.63 D. 38.82

200. The population of a nest of ants can multiply threefold (triple) in 8 weeks. If the population is now 12 000, how many weeks will it take for the population to reach 300 000 ants?

201. The radioactivity of a certain substance decays by 20% in 30 hours. What is the half-life of the substance?

202. The intensity of light reduces by 7% for every 3 metres below the surface of water. At what depth will the light intensity be reduced to 60% of its original amount?

203. The population of Canada is 30 million people and is growing at an annual rate of 1.4%. The population of Germany is 80 million people and is decreasing at an annual rate of 1.7%. In how many years will the population of Canada be equal to the population of Germany?

204. Determine the domain of the function $y = \log(2x + 3)$.

A. $x > -\frac{3}{2}$ B. $x > -\frac{2}{3}$ C. $x > \frac{2}{3}$ D. $x > \frac{3}{2}$

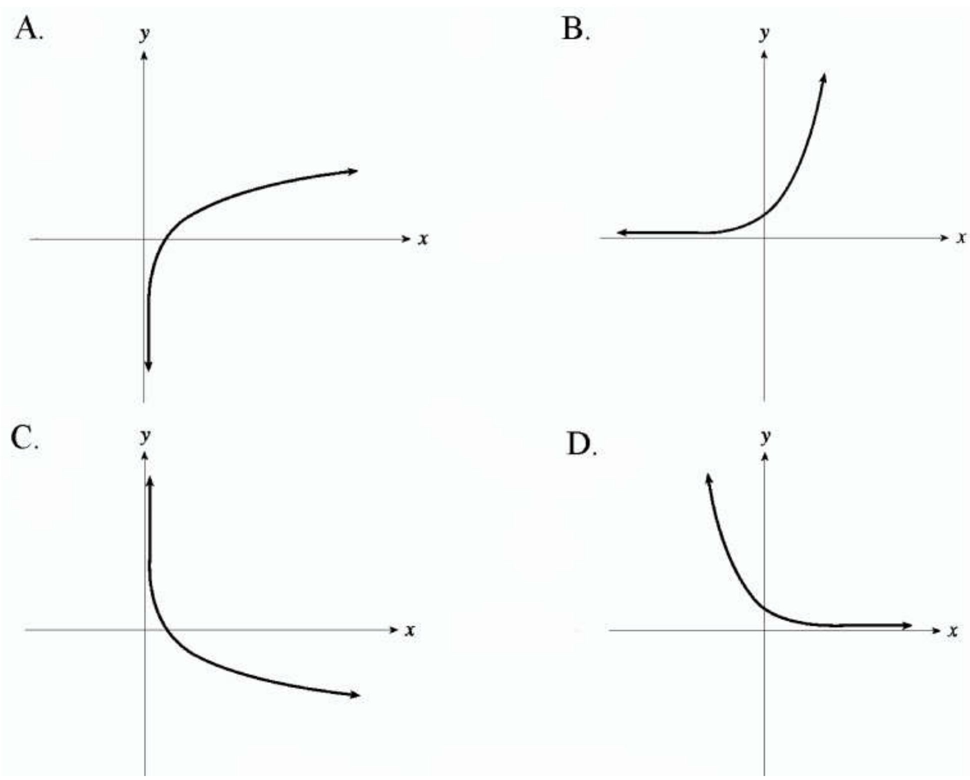
205. In 1976, an earthquake in Guatemala had a magnitude of 7.5 on the Richter scale and in 1960, an earthquake in Morocco had a magnitude of 5.8. How many times as intense was the 1976 Guatemalan earthquake compared to the 1960 Morrocan earthquake?

A. 1.29 B. 1.7 C. $10^{1.29}$ D. $10^{1.7}$

206. In chemistry, the pH scale measures the acidity (0-7) or alkalinity (7-14) of a solution. It is a logarithmic scale in base 10. Thus, a pH of 5 is 10 times more acidic than a pH of 6. Solution A has a pH of 5.7. Solution B is 1260 times more acidic than Solution A. Find the pH of solution B.

A. 2.6　　B. 4.4　　C. 7.0　　D. 8.8

207. If $0 < a < 1$, which of the following is the best graph of $y = \log_a x$?



ADDITIONAL QUESTIONS

208. Simplify: $(\log_x y)(\log_y x)$

A. 0　　B. 1　　C. $xy^{(x+y)}$　　D. $\log_{xy}(x+y)$

209. Simplify: $\log_b(b\sqrt{b})$

A. $\frac{1}{2}$　　B. $\frac{3}{2}$　　C. $b^{\frac{1}{2}}$　　D. $b^{\frac{3}{2}}$

210. If $\log_5 x = 4.26$, what is the value of $\log_5 25x^2$?

A. 2.66　　B. 3.80　　C. 8.26　　D. 10.52

211. Which of the following is equivalent to $\log 3x^2$?

A. $2(\log 3 + \log x)$ B. $\log 9 - 2\log x$ C. $2\log 3 + \log x$ D. $\log 3 + 2\log x$

212. If $a = b^{c \log_b d}$, then which of the following must be true?

A. $a = cd$ B. $a = b^c$ C. $a = d^c$ D. $a = dc$

213. If $a = 2\log_4 Q$ and $b = \log_4 P$, determine an expression for $\frac{Q}{P}$.

A. $\frac{a}{2b}$ B. $\frac{2a}{b}$ C. 2^{a-2b} D. 2^{2a-b}

214. Given that $y_1 = \log_a 5$ and $y_2 = \log_a 3$ where $0 < a < 1$, which of the following must be true?

A. $y_1 > 5$ B. $y_1 < y_2$ C. $y_1 > y_2$ D. $3 < y_2 < 5$

215. The inverse relation of $y = \log 2x$ is given by which one of the following?

A. $y = \frac{10^x}{2}$ B. $y = 5^x$ C. $y = 10^{2x}$ D. $y = \frac{1}{\log 2x}$

216. Solve for x: $\log_2[\log_x(\log_3 9)] = -1$

A. 2 B. 3 C. 4 D. 5

217. Evaluate: $\sum_{k=3}^{5} \log_k k^2$

A. 1 B. 2 C. 6 D. 8

218. Evaluate: $\sum_{k=2}^{4} \log_6 k$

A. 0.60 B. 1.23 C. 1.77 D. 4.00

219. Determine the sum of the first 12 terms of the series $\log_b 1 + \log_b 10 + \log_b 100 + \ldots$

A. $\dfrac{66}{\log b}$ B. $\dfrac{72}{\log b}$ C. 66 D. 72

For the next 6 problems, solve for x:

220. $2\log(3-x) = \log 2 + \log(22-2x)$

221. $\log_{12}(3-x) + \log_{12}(2-x) = 1$

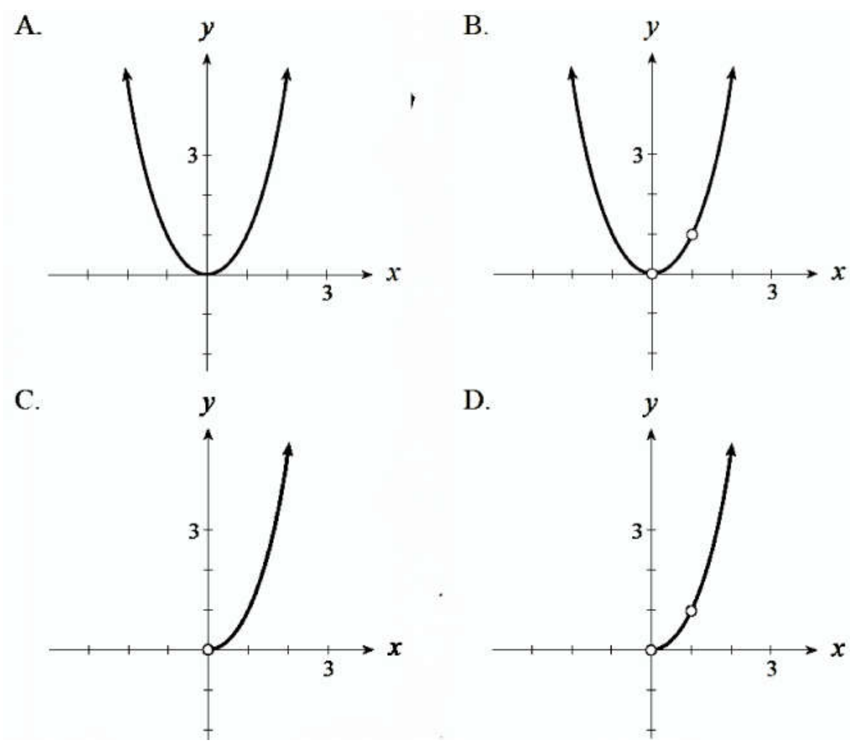
222. $\log_5(2x+1) = 1 - \log_5(x+2)$

223. $\log(10-3x) - 2\log x = 0$

224. $\log_4(7-3x)+\log_4(x+4)=2$

225. $\log_2(x+7)+\log_2(x+5)=3$

226. Which of the following is a graph of $\log_x y = 2$?

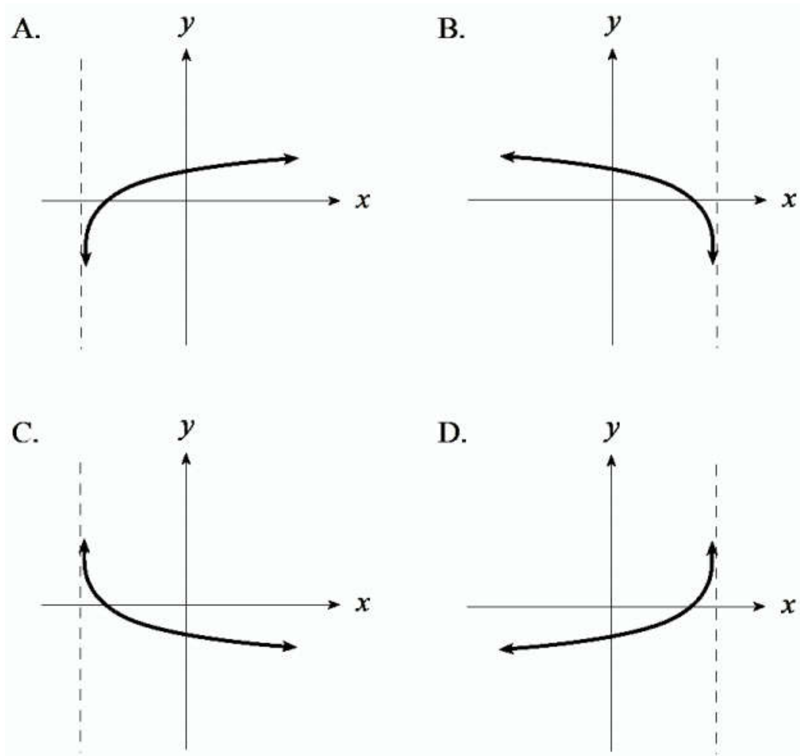


227. Determine how many monthly investments of \$50 would have to be deposited into a savings account that pays 3% annual interest, compounded monthly, for the accountÐs future value to be \$50,000. Express your answer as a whole number.

Use the formula: $FV = \frac{R((1+i)^n - 1)}{i}$, where

FV = the future value
R = the investment amount
i = (the annual interest rate)÷(the number of compounding periods per year)
n = the number of investments

228. Which graph best represents the function $y = -\log_3(x+5)$?



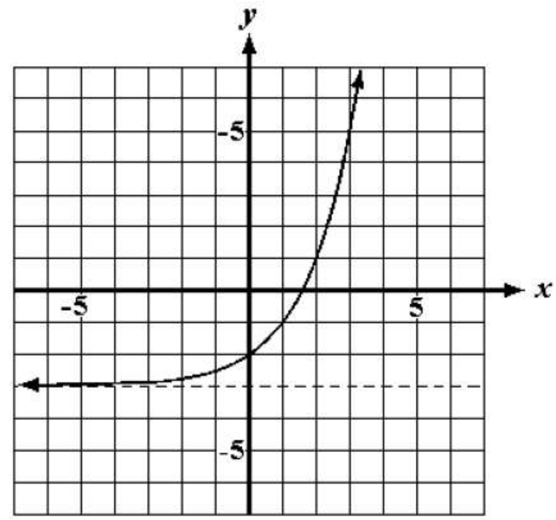
229. The graph of the function $f(x)$ shown is best described by the equation:

A. $f(x) = 2^{x+3}$

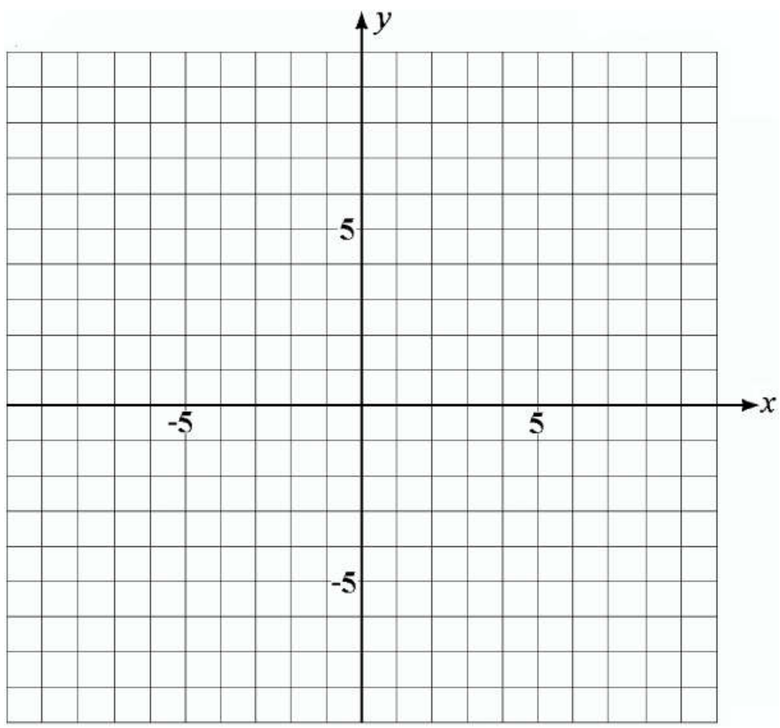
B. $f(x) = 2^{x} + 3$

C. $f(x) = 2^{x-3}$

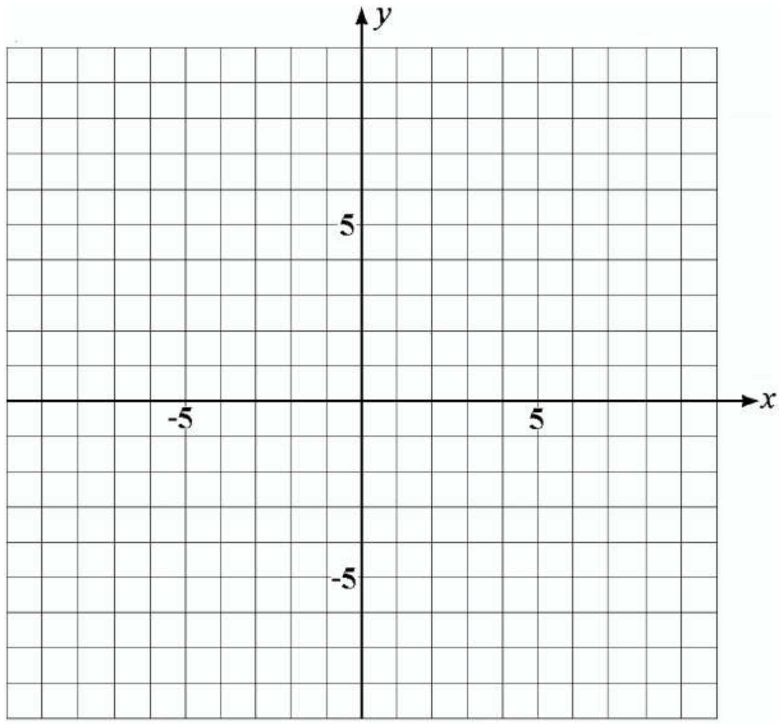
D. $f(x) = 2^{x} - 3$



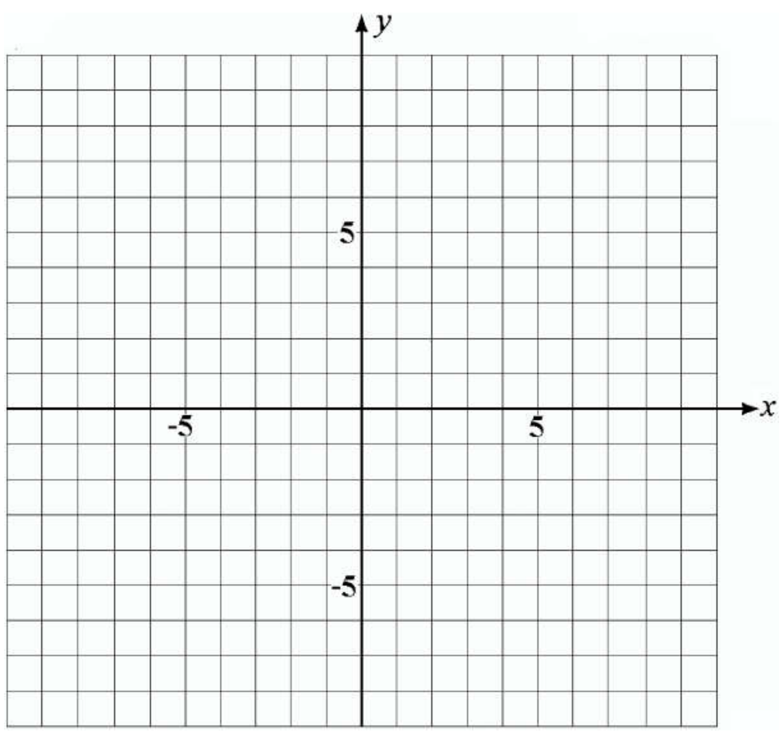
230. Sketch the graphs of: a) $y = 3^{x}$ and b) $y = 2\,(3^{x}) + 1$



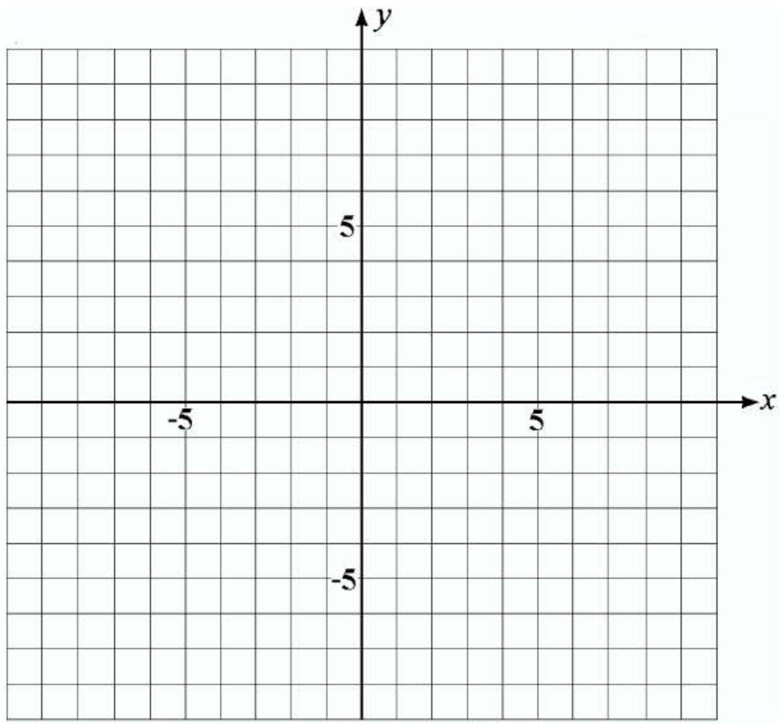
231. Sketch the graphs of: a) $y = \left(\frac{1}{4}\right)^x$ and b) $y = 2\left(\frac{1}{4}\right)^x$



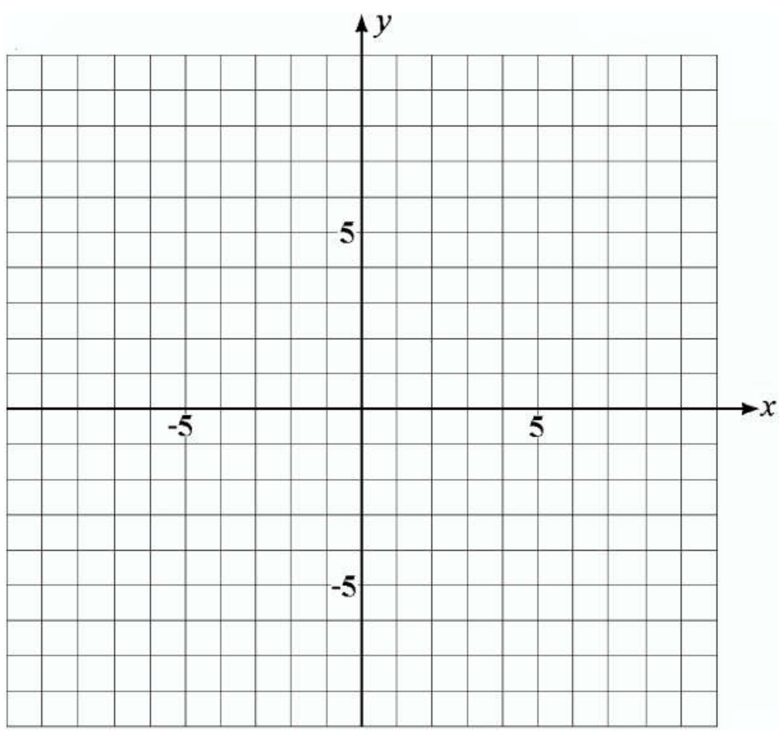
232. Sketch the graphs of: a) $y = 3^x$ and b) $y = \log_3 x$



233. Sketch the graph of: $y = \log_5(x + 2)$



234. Given the function $f(x) = 3^{x-2} + 1$, sketch the graphs of a) $y = f(x)$ and b) $y = f^{-1}(x)$, and determine the equation of $f^{-1}(x)$.



235. Sketch the graphs of: a) $y = \log_2 x$ and b) $y = \log_2(-(x-2))$