

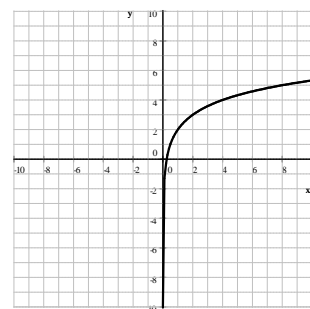
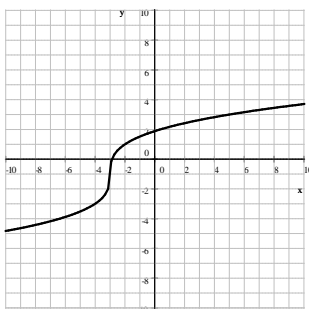
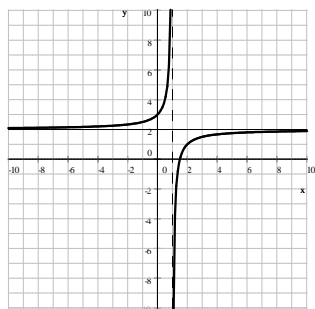
Review Problems

- Write each of the following as a single logarithm.
 - $\ln(x+1) + \ln(x-1)$
 - $\log_{10}(24x^3) - \log_{10}(3x)$
 - $\frac{1}{2} \ln(100x^{100})$
 - $\frac{1}{2} \log_2(36x^{16}) - 2 \log_2(3x) + \log_2 6 - 6 \log_2 x$
 - $(\log_3 4)(\log_4 7)$
- Let $a = \log_5 3$. Write each of the following in terms of a .
 - $\log_5 45$
 - $\log_5 75$
 - $\log_3 5$
 - $\log_5 675$
 - $\log_{45} 675$
- Graph each of the following.
 - $f(x) = \frac{2x-3}{x-1}$
 - $f(x) = 2\sqrt[3]{x+3} - 1$
 - $f(x) = \log_2(8x) - 1$
- Find the domain for each of the following functions.
 - $f(x) = \frac{\sqrt{5x-x^2}}{x-5}$
 - $f(x) = \log_2(x^2 - 6x + 5) + \sqrt{x+3}$
 - $h(x) = \frac{1}{-1 + \ln x}$
 - $h(t) = \sqrt{3 - \sin t}$
- We place \$1000 into a bank account with an annual compound interest rate of 8%, compounded annually. How long does it take for the money in the account to reach \$1000 000?
- Suppose that α is an angle in the first quadrant with $\sin \alpha = \frac{3}{5}$ and β is an angle in the second quadrant with $\cos \beta = -\frac{5}{13}$. Compute the exact value of each of the following.
 - $\cos \alpha$
 - $\tan \alpha$
 - $\sin 2\alpha$
 - $\cos 2\alpha$
 - $\tan 2\alpha$
 - $\sin \beta$
 - $\tan \beta$
 - $\sin 2\beta$
 - $\cos 2\beta$
 - $\tan 2\beta$
 - $\sin(\alpha + \beta)$
 - $\cos(\alpha + \beta)$
 - $\tan(\alpha + \beta)$
- Compute the exact value of each of the following.
 - $\sin 75^\circ$
 - $\tan 255^\circ$
 - $\frac{\tan 25^\circ + \tan 20^\circ}{1 - (\tan 25^\circ)(\tan 20^\circ)}$
 - $\cos 105^\circ$
- Prove, using the sum formula that for all x ,
 - $\sin(x + 180^\circ) = -\sin x$
 - $\cos(x + 180^\circ) = -\cos x$
 - $\tan(x + 180^\circ) = \tan x$
- Suppose that α is an angle with $\cos \alpha = -\frac{2}{3}$. Compute the exact value of $\cos 2\alpha$.
- Suppose that α and β are acute angles with $\cot \alpha = 7$ and $\cos \beta = \frac{3}{\sqrt{10}}$. Compute the exact value of each of the following.
 - $\tan \beta$
 - $\tan 2\beta$
 - $\tan(\alpha + 2\beta)$
- Find the exact value of $\tan \alpha$ if $\tan \beta = -\frac{1}{5}$ and $\tan(\alpha + \beta) = \frac{7}{17}$.

12. Find the exact value of $\tan \alpha$ if $\tan 2\alpha = \frac{4}{3}$.
13. Find a formula for $\cot(x + y)$.
14. Solve each of the following equations.
- a) $\cos 2x = \sin x$ f) $\sin x + 1 = \cos^2 x + 2$ j) $\log_2(1 - 3x) + \log_2(3 - x) = 7$
 b) $\sin 2x = \cos x$ g) $\sqrt{x - 2} + \sqrt{x + 3} = 5$ k) $\log_3(3x - 5) - \log_3(x - 6) = -2$
 c) $\cos 2x = \cos x$ h) $\log_2(2x - 7) - \log_2(5x - 1) = -3$
 d) $\sin x + \sin 2x = \tan x$ i) $\frac{3}{8} \ln(2x - 5) = 21$
 e) $\cos x + \frac{\sin^2 x}{\cos x} + \sin x + \sin 2x = \frac{1}{\cos x}$
15. Find an equation for all tangent lines drawn to the graph of $y = -\frac{1}{2}x^2 + 3x - 2$ from the point $P(4, 4)$.

Answers

- 1.) a) $\ln(x^2 - 1)$ b) $\log_{10}(8x^2)$ c) $\ln(10x^{50})$ d) 2 e) $\log_3 7$
- 2.) a) $2a + 1$ b) $a + 2$ c) $\frac{1}{a}$ d) $3a + 2$ e) $\frac{3a + 2}{2a + 1}$
- 3.) a) $f(x) = \frac{2x - 3}{x - 1} = -\frac{1}{x - 1} + 2$ b) $f(x) = 2\sqrt[3]{x + 3} - 1$ c) $f(x) = \log_2(8x) - 1 = \log_2 x + 2$



- 4.) a) $[0, 5)$ b) $[-3, 1) \cup (5, \infty)$ c) $(0, \infty) \setminus \{e\}$ d) \mathbb{R} 5.) $t = \frac{\ln 1000}{\ln 1.08} \approx 89.756521$ years
- 6.) a) $\frac{4}{5}$ b) $\frac{3}{4}$ c) $\frac{24}{25}$ d) $\frac{7}{25}$ e) $\frac{24}{7}$ f) $\frac{12}{13}$ g) $-\frac{12}{5}$ h) $-\frac{120}{169}$
- i) $-\frac{119}{169}$ j) $\frac{120}{119}$ k) $\frac{33}{65}$ l) $-\frac{56}{65}$ m) $-\frac{33}{56}$
- 7.) a) $\frac{\sqrt{6} + \sqrt{2}}{4}$ b) $\sqrt{3} + 2$ c) 1 d) $\frac{\sqrt{2} - \sqrt{6}}{4}$

8.) a) $\sin(x + 180^\circ) = \sin x \cos 180^\circ + \cos x \sin 180^\circ = \sin x (-1) + \cos x (0) = -\sin x$

b) $\cos(x + 180^\circ) = \cos x \cos 180^\circ - \sin x \sin 180^\circ = \cos x (-1) - \sin x (0) = -\cos x$

c) $\tan(x + 180^\circ) = \frac{\tan x + \tan 180^\circ}{1 - \tan x \tan 180^\circ} = \frac{\tan x + 0}{1 - \tan x \cdot 0} = \frac{\tan x}{1} = \tan x$

9.) $-\frac{1}{9}$ 10.) a) $\frac{1}{3}$ b) $\frac{3}{4}$ c) 1 11.) $\frac{2}{3}$ 12.) -2 or $\frac{1}{2}$

13.) $\cot(x + y) = \frac{\cot x \cot y - 1}{\cot x + \cot y}$

14.) a) $-\frac{\pi}{2} + 2k\pi, \frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi$ where $k \in \mathbb{Z}$ b) $\frac{\pi}{2} + 2k\pi, \frac{\pi}{6} + 2k\pi, \frac{5\pi}{6} + 2k\pi$ where $k \in \mathbb{Z}$

c) $2k\pi, \pm \frac{2\pi}{3} + 2k\pi$ where $k \in \mathbb{Z}$ d) $k\pi, \pi + 2k\pi, \pm \frac{1}{3}\pi + 2k\pi$ where $k \in \mathbb{Z}$

e) $k\pi, \pm \frac{2\pi}{3} + 2k\pi$ where $k \in \mathbb{Z}$ f) $\frac{\pi}{2} + 2k\pi$ where $k \in \mathbb{Z}$ g) 6 h) 5

i) $\frac{1}{2}e^{56} + \frac{5}{2}$ j) -5 k) no solution 15.) $y = x$ and $y = -3x + 16$