

1) Solve for n if: $13 \binom{2n}{n+2} = 7 \binom{2n+1}{n+3}$

2) Solve each equation for x where $-\pi \leq x < \pi$. Give exact values whenever possible, otherwise round answers to the nearest hundredth of a radian.

a. $3\sin^2 x - \cos x + \frac{1}{3} = 0$ b. $4\sin 2x - \sin x = 0$ c. $4\sec^2 x + 17\tan x = 0$

3) Find exact values for each of the following:

a. $\cos\left(\sin^{-1}\left(\frac{3}{5}\right) + \tan^{-1}\left(\frac{5}{12}\right)\right)$ b. $\sin\left(\cos^{-1}\left(\frac{1}{3}\right) + \sin^{-1}\left(-\frac{5}{8}\right)\right)$

c. $\cos\left(2\cos^{-1}\left(\frac{1}{3}\right)\right)$

4) Find the inverse of each function and give its domain:

a. $f(x) = 3e^{x-1}$ b. $g(x) = \frac{3x}{x-3}$ c. $h(x) = -2 + \cos(2x-1)$

(Assume x is in an appropriate domain for inverse function)

5) Write, as a single fraction, an explicit formula for $S_n = \sum_{k=1}^n k^2 + 3k - 2$.

6) **Exploration:** Use Winplot, Mathematica, or another computer graphing program do the following.

a) $g(x) = 2^{\cos x}$ is periodic but not sinusoidal. State the period, domain, and range of this function. Attach a printout of your graph.

b) $h(x) = 2^{\cos(ax)}$. Examine how the graph changes as a changes. This would be a good time to use a parameter a and animate it with a slider. Generalize the effect changing a has on the graph.

c) $j(x) = b^{\cos x}$. Generalize the effect of changing b . Include any restrictions on b .

d) $f(x) = b^{\cos(ax)}$. State the period, domain, and range of f . Assume $b > 0$.

7) **NC** (Do not use \sum key.) Evaluate the sums:

a) $\sum_{n=1}^{2011} -1^n n$

b) $\sum_{n=1}^{2011} i^n$

c) $\sum_{n=1}^{\infty} \left(\frac{i}{2}\right)^n$

8) Cucumbers are on sale, so you buy 100 pounds of them at the local market for your restaurant. Each cucumber is actually 99% water. A few days later, the cucumbers have dried out to the point that each is now 95% water. How much do all your cucumbers weigh at this time?

9) Find exact value for $\log(100!) - \log(99!)$.

10) Find the sum of all the positive integers less than 1000 that are *not* divisible by 19.

11) Solve the following equation for x where $0 \leq x < 2\pi$: (Hint: divide both sides by 2)

$$\sin x + \sqrt{3} \cdot \cos x = -\sqrt{2}$$

12) Examine the graph of $y = \cos \sin^{-1} x$.

a) Find an algebraic formula not involving trigonometry that yields this graph. State the domain and range.

b) Give an algebraic argument (using trig) as to why this is a semicircle.