More problems for section 4.3 of *Essentials of Precalculus with Calculus Previews* by Zill and Dewar, 5e.

1. Make a sketch of the following functions **by hand**. Use graph paper. (You'll find some on our syllabus.) Sketch your graph for at least two periods of the given function. Label points where the function takes its maximum, minimum, and average values. Check your work by graphing the functions on a graphing calculator.

a. $\sin 2x$ b. $\cos 3x$ c. $\sin 2\pi x$

d. $2\cos 3\pi x$ e. $-\frac{1}{2}\sin\frac{1}{2}x$ f. $-3\cos\frac{\pi}{4}x$

g. $\sin\left(2x+\frac{\pi}{4}\right)$ h. $\cos\left(3x+\frac{\pi}{2}\right)$ i. $\sin(2\pi x-\pi)$

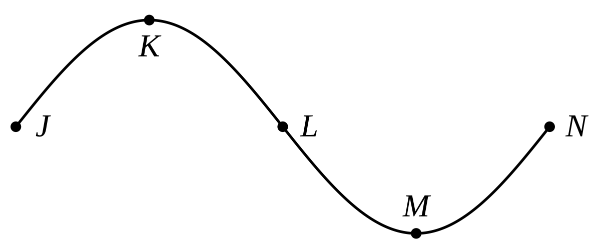
j. $2\cos\left(3\pi x-\frac{\pi}{2}\right)$ k. $-\frac{1}{2}\sin\left(\frac{1}{2}x+\frac{\pi}{4}\right)$ l. $-3\cos\left(\frac{\pi}{4}x-\frac{\pi}{2}\right)$

m. $1+\sin\left(2x+\frac{\pi}{4}\right)$ n. $1-\cos\left(3x+\frac{\pi}{2}\right)$ o. $2+\sin(2\pi x-\pi)$

p. $1-2\cos\left(3\pi x-\frac{\pi}{2}\right)$ q. $1-\frac{1}{2}\sin\left(\frac{1}{2}x+\frac{\pi}{4}\right)$ r. $2-3\cos\left(\frac{\pi}{4}x-\frac{\pi}{2}\right)$

2. Given (some of) the coordinates of the points JKLMN, find find an equation for this curve, having one of the forms

$$y = A\sin(Bx) \qquad \text{or} \qquad y = A\cos(Bx) \qquad (B>0)$$



a. $J=(-2,0)$, $K=(0,3)$, $L=(2,0)$, $M=(4,-3)$, $N=(6,0)$
b. $J=(0,0)$, $K=(1/4,-5)$, $L=(1/2,0)$, $M=(3/4,5)$, $N=(1,0)$
c. $J=(-\pi/4,0)$, $K=(0,-7)$, $L=(\pi/4,0)$, $M=(\pi/2,7)$, $N=(3\pi/4,0)$
d. $J=(0,0)$, $K=(1/2,\pi)$, $L=(1,0)$
e. $J=(0,0)$, $K=(\pi/8,-3)$, $L=(\pi/4,0)$
f. $J=(-1,0)$, $K=(0,2)$, $L=(1,0)$
g. $J=(0,0)$, $M=(0.3,-8)$, $N=(0.4,0)$
h. $J=(-\pi/6,0)$, $K=(0,-5)$

3. **This problem is optional in Fall 2010.** Given (some of) the coordinates of the points JKLMN, find find two equations for this curve, having the forms

$$y = A + B\sin(Cx + D) \qquad \text{and} \qquad y = E + F\cos(Gx + H)$$

There are many correct answers to each of these problems, but any two correct answers must be related by the formulas

$$\begin{array}{lll} \sin(x \pm \pi) = -\sin x & \sin(x \pm 2\pi) = \sin x & \sin(x + \pi/2) = \cos x \\ \cos(x \pm \pi) = -\cos x & \cos(x \pm 2\pi) = \cos x & \cos(x - \pi/2) = \sin x \end{array}$$

a. $J = (1/3, 4)$, $K = (5/6, 7)$, $L = (4/3, 4)$, $M = (11/6, 1)$, $N = (7/3, 4)$

b. $J = (-\pi/2, -2)$, $K = (\pi/2, -1)$, $L = (3\pi/2, -2)$, $M = (5\pi/2, -3)$, $N = (7\pi/2, -2)$

c. $J = (\pi/2, 1)$, $K = (3\pi/4, 3/2)$, $L = (\pi, 1)$, $M = (5\pi/4, 1/2)$, $N = (3\pi/2, 1)$

d. $L = (1, 1)$, $M = (2, -2)$, $N = (3, 1)$

e. $K = (\pi/12, 2)$, $M = (7\pi/12, -1)$

f. $J = (\pi/2, 3)$, $K = (2\pi/3, 8)$

Answers

2a. $y = 3\cos(\pi x/4)$ 2b. $y = -5\sin(2\pi x)$ 2c. $y = -7\cos(2x)$ 2d. $y = \pi\sin(\pi x)$ 2e. $y = -3\sin(4x)$ 2f. $y = 2\cos(\pi x/2)$ 2g. $y = 8\sin(5\pi x)$ 2h. $y = -5\cos(3x)$ 3a. $y = 4 + 3\sin(\pi x - \pi/3)$ and $y = 4 + 3\cos(\pi x - 5\pi/6)$ 3b. $y = -2 + \sin(\frac{1}{2}x + \pi/4)$ and $y = -2 + \cos(\frac{1}{2}x - \pi/4)$ 3c. $y = 1 + \frac{1}{2}\sin(2x - \pi)$ and $y = 1 + \frac{1}{2}\cos(2x - 3\pi/2)$ [other solutions include $y = 1 - \frac{1}{2}\sin(2x)$ and $y = 1 - \frac{1}{2}\cos(2x - \pi/2)$] 3d. $y = 1 - 3\sin(\pi x/2 - \pi/2)$ and $y = 1 + 3\cos(\pi x/2)$ 3e. $y = 1/2 + 3/2\sin(2x + \pi/3)$ and $y = 1/2 + 3/2\cos(2x - \pi/6)$ 3f. $y = 3 - 5\sin(3x - \pi/2)$ and $y = 3 + 5\cos(3x)$