Mock Test 3.1, Version 4

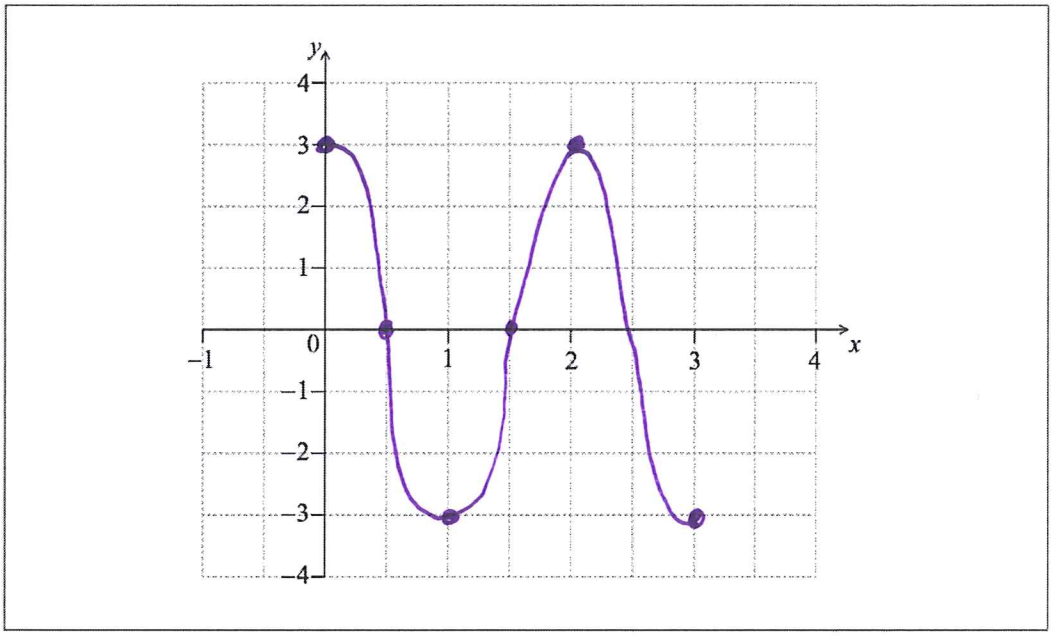
Foundational
ONE:

Let $f(x) = 3\sin(\pi x)$.

(a) Write down the amplitude of f. 3

(b) Find the period of f. $bp = 2\pi$, $\pi p = 2\pi$, $p = 2$

(c) On the following grid, sketch the graph of $y = f(x)$, for $0 \le x \le 3$. [4]



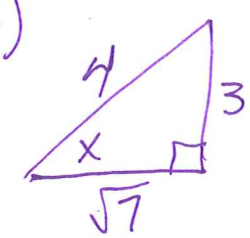
TWO:

Given that $\sin x = \frac{3}{4}$, where x is an obtuse angle, find the value of

(a) $\cos x$; → $-\sqrt{7}/4$ [4]

(b) $\cos 2x$. → $-\frac{1}{8}$ [3]

a)



b) $\cos(2x) = 1 - 2\sin^2(x)$

$= 1 - 2\left(\frac{3}{4}\right)^2$

$= 1 - 2\left(\frac{9}{16}\right)$

$= 1 - \frac{18}{16} = -\frac{2}{16} = -\frac{1}{8}$

Moderate

THREE:

Suppose $f(x) = \cos x$ and $g(x) = 2x$.

Solve the following equations on the domain $0 \leqslant x \leqslant 2\pi$:

a $(f \circ g)(x) = 1$

a) $\cos(2x) = 1$

$2x = 0 \qquad 2x = 2\pi$

$x = 0 \qquad x = \pi$

b $(g \circ f)(x) = 1$

$2\cos x = 1$

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

$x = \frac{\pi}{3}, \frac{5\pi}{3}$

FOUR:

Let $a = \sin 20°$ and $b = \tan 50°$. In terms of a and b, write expressions for:

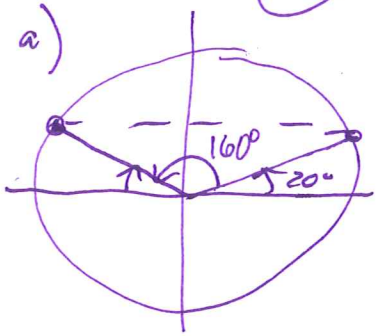
a $\sin 160°$ a

b $\tan(-50°) = -b$

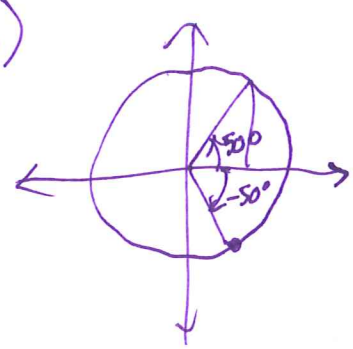
c $\cos 70° = a$

d $\tan 20°$

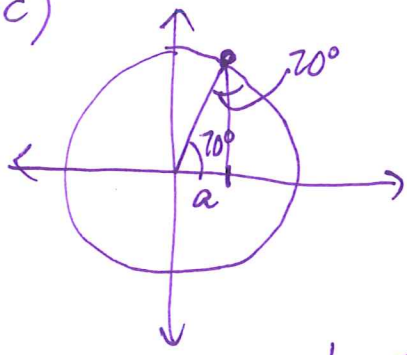
a)



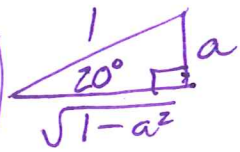
b)



c)



$\tan 20° = \frac{a}{\sqrt{1-a^2}}$



High Challenge

FIVE:

Show that $\dfrac{\sin 2\theta - \sin\theta}{\cos 2\theta - \cos\theta + 1}$ simplifies to $\tan\theta$.

$$\frac{2\sin\theta\cos\theta - \sin\theta}{2\cos^2\theta - 1 - \cos\theta + 1} = \frac{2\sin\theta\cos\theta - \sin\theta}{2\cos^2\theta - \cos\theta}$$

$$= \frac{\sin\theta(2\cos\theta - 1)}{\cos\theta(2\cos\theta - 1)} = \tan\theta$$