$$f' \quad \underline{\quad + \quad 0 \quad + \quad 0 \quad - \quad 0 \quad + \quad}$$
$$\frac{\pi}{2} \qquad \frac{7\pi}{6} \qquad \frac{11\pi}{6}$$
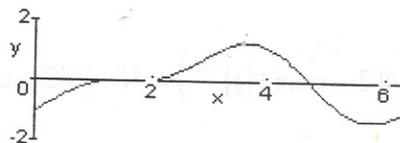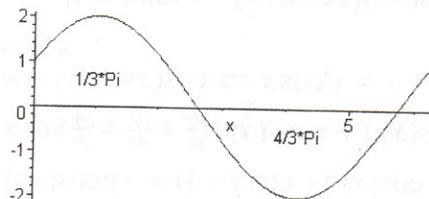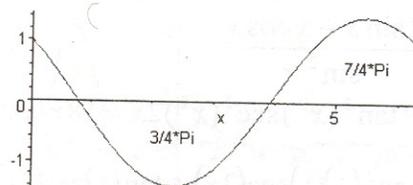

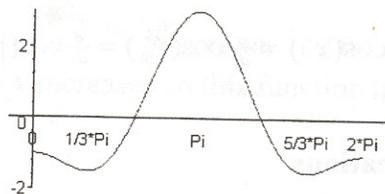$\frac{\pi}{2}$ is a stationary point, $\frac{7\pi}{6}$ is a global maximum point and $\frac{11\pi}{6}$ is a global minimum point.

3. $f'(x) = -\sin x + \sqrt{3}\cos x = 0 \iff \tan x = \sqrt{3}$
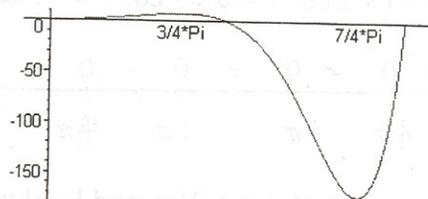$\Rightarrow x = \frac{\pi}{3}, \frac{4\pi}{3}$

4. $f'(x) = -\sin x - \cos x = 0 \iff \tan x = -1$
$\Rightarrow x = \frac{3\pi}{4}, \frac{7\pi}{4}$

5. $f'(x) = -2\sin 2x + 2\sin x = -4\sin x \cos x + 2\sin x$
$= 2\sin x(-2\cos x + 1) = 0 \iff \sin x = 0 \text{ or } \cos x = \frac{1}{2}$
$\Rightarrow x = 0, \pi, 2\pi, \quad \frac{\pi}{3}, \frac{5\pi}{3}$

6. $f' = e^x \sin x + e^x \cos x = e^x(\sin x + \cos x) = 0$
$\iff \tan x = -1 \Rightarrow x = \frac{3\pi}{4}, \frac{7\pi}{4}$

7. The tangent line approximation to $f(x) = \sin(x)$ is $y = x$. $f'(x) = \cos x$, $f''(x) = -\sin x$. f'' is positive to the left of zero and negative to the right of zero, hence f is concave up to the left of zero and concave down to the right of zero.

	actual	approximation	approximation relation to actual
(a) $\sin 0.2$	$= 0.1986693$	$\cong 0.2$	too large
(b) $\sin 0.1$	$= 0.0998334$	$\cong 0.1$	too large
(c) $\sin 0.01$	$= 0.0099998$	$\cong 0.01$	too large
(d) $\sin(-0.1)$	$= -0.0998334$	$\cong -0.1$	too small

8. $\tan\theta = \frac{x}{30} \Rightarrow \sec^2\theta \frac{d\theta}{dt} = \frac{1}{30}\frac{dx}{dt} \Rightarrow$
$\frac{d\theta}{dt} = \cos^2\theta \frac{1}{30}\frac{dx}{dt} \Rightarrow \frac{d\theta}{dt}\big|_{x=50} = \frac{900}{3400}\frac{1}{30\,ft}(-46\frac{ft}{sec}) \approx -0.4059 \frac{rad}{sec}$