21.3 Applications

1. (a) $f'(x) = 1 + 2\cos x = 0 \Leftrightarrow \cos x = -\frac{1}{2} \Leftrightarrow x = \frac{2}{3}\pi + k(2\pi)$ *or* $x = \frac{4}{3}\pi + k(2\pi)$

(b) + 0 - 0 + 0 - 0 +

$\frac{2}{3}\pi \quad \frac{4}{3}\pi \quad \frac{8}{3}\pi \quad \frac{10}{3}\pi$

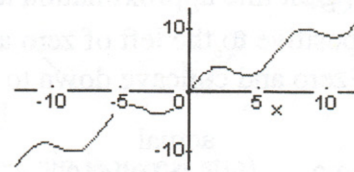
decreasing on $[\frac{2}{3}\pi + 2k\pi, \frac{4}{3}\pi + 2k\pi]$

increasing on $[-\frac{2}{3}\pi + 2k\pi, \frac{2}{3}\pi + 2k\pi]$

(c) local maxima at $\frac{2}{3}\pi + 2k\pi$ and local minima at $\frac{4}{3}\pi + 2k\pi$

(d) no global max or min as keeps on climbing

f)



(e) $f''(x) = -2\sin x = 0$ for $x = k\pi$

\- 0 + 0 - 0 + 0 -

$\pi \quad 2\pi \quad 3\pi \quad 4\pi$

therefore f is concave up on $[(2n-1)\pi, 2n\pi]$ and concave down on $[2n\pi, (2n+1)\pi]$

2. (a) $\cos x$ has period 2π, $\sin 2x$ has period π, so it also repeats in 2π, so f has period 2π.

(b) $f'(x) = \sin x + \cos 2x = \sin x + 1 - 2\sin^2 x = (1 + 2\sin x)(1 - \sin x) = 0 \Leftrightarrow x = \frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$