L-6 Applications Of Derivatives (Worksheet Mod 1 of 3)

Do as directed.

1. Find the intervals in which the function f given by $f(x) = 4x^3 - 6x^2 - 72x + 30$ is
   a) Strictly increasing b) strictly decreasing

2. Find the intervals in which the function f given by $f(x) = \sin x + \cos x, 0 \leq x \leq 2\pi$ is
   a) Strictly increasing b) strictly decreasing

3. Show that $y = \log(1 + x) - \frac{2x}{2+x}$, $x > -1$, is an increasing function of x throughout its domain.

4. Prove that $y = \frac{4\sin\theta}{(2+\cos\theta)} - \theta$ is an increasing function of θ in $\left[0, \frac{\pi}{2}\right]$.

5. Prove that the function f is given by $f(x) = x^2 - x + 1$ is neither strictly increasing nor strictly decreasing on $(-1, 1)$.

6. Show that for $a \geq 1, f(x) = \sqrt{3}\sin x - \cos x - 2ax + b$ is decreasing in R.

7. Show that the function f defined by $f(x) = \tan^{-1}(\sin x + \cos x)$ is strictly increasing in the interval $\left(0, \frac{\pi}{4}\right)$.

8. Prove that the function f defined by $f(x) = \log\sin x$ is strictly increasing on $\left(0, \frac{\pi}{2}\right)$ *and* strictly decreasing on $\left(\frac{\pi}{2}, \pi\right)$.
9. The interval in which $y = x^2 e^{-x}$ is increasing in
   a) $(-\bowtie, \bowtie)$ b) $(-2, 0)$ c) $(2, \bowtie)$ d) $(0, 2)$

10. On which of the following intervals is the function f given by $f(x) = x^{100} + \sin x - 1$ is strictly decreasing.
    a) $(0, 1)$ b) $(\frac{\pi}{2}, \pi)$ c) $(0, \frac{\pi}{2})$ d) $None\ of\ these$