Worksheet 10

1. Find the exact value of each of the following:

   (a) $\tan^{-1}(\cos \pi)$

   (b) $\tan(\cos^{-1} \frac{1}{\sqrt{2}})$

   (c) $\sin^{-1}\left(\sin \frac{5\pi}{6}\right)$

   (d) $\sec(\arctan x)$ [express as func. of x]

2. Differentiate each of the following functions and simplify:

   (a) $f(x) = \tan^{-1}(x^2 + 1)$

   (b) $u(t) = t \ln(t^2 - 3)$

   (c) $y = \arccos(3x)$

   (d) $f(x) = \ln(\ln(x))$

   (e) $h(t) = \sqrt{\tan^{-1}(3t)}$

   (f) $f(x) = x^{\ln x}$

   (g) $y = \ln \sqrt{xe^x}$

   (h) $g(y) = \sin^{-1}(\sqrt{2y + 1})$

   (i) $y = x^{-1/x}$

   (j) $f(x) = \ln \sqrt{\dfrac{4x - 7}{x^2 + 2x}}$

3. Find solutions to each of the following, as instructed.

   a) Find an equation of the tangent line to the graph of $y = \dfrac{\ln x}{x}$ at $x = e^2$.

   b) Find an equation of the tangent line to the graph of $f(x) = (x - 1)\sin^{-1}(x)$ at $x = 0$.

   c) Find the x coordinate of the point(s) where $f(x) = \tan^{-1}\left(\dfrac{x}{2}\right) - \tan^{-1}\left(\dfrac{x}{8}\right)$ has horizontal tangents.

   d) Find the intervals on which $y = \sqrt{x}\ln x$ is increasing, and also the intervals on which it is concave up.

4. Find dy/dx for each of the following

   a) $y \ln(x) = \sin(y^2)$

   b) $y = (\sin x)^{\cos x}$

   c) $y = x \ln(|x|) - x$

   d) $y = \dfrac{(2x + 1)^3}{x^5 \sqrt{x + 1}}$

   e) $x = t \ln t, \;\; y = \ln \sqrt{t + 1}$