1. Differentiate

(7) (a) \( D_x \ln(\tan x - \csc x) \)

(7) (b) \( D_x \log_3 \sqrt{x} \)

(7) (c) \( D_x e^{\sqrt{\sin x}} \)

(7) (d) \( D_x x^{\sin^{-1} x} \)

(7) (e) \( D_x \sec^{-1} \sqrt{x} \)
(8) 2. If \( f(x) = x^7 + 3x^3 - 1 \) find an equation of the tangent line to the graph of \( y = f^{-1}(x) \) at the point \((3, 1)\).

(9) 3. Find the area under the curve \( y = \csc x \) from \( x = \frac{\pi}{4} \) to \( x = \frac{3\pi}{4} \). In your answer, give exact values for trig functions of \( \frac{\pi}{4} \) and \( \frac{3\pi}{4} \).
4. Integrate:

(8) (a) \[ \int \sec 3x \, dx \]

(8) (b) \[ \int \cosh x \sinh x \, dx \]

(8) (c) \[ \int_0^1 \frac{dx}{(9 + x^2)} \]

(8) (d) \[ \int x^2 \sin x \, dx \]

(8) (e) \[ \int \frac{2x + 3}{\sqrt{4 - x^2}} \, dx \]
5. A radioactive isotope has a half-life of 1200 years. How long will it take for 10 gm of the isotope to decay so that only 2 gm of the isotope remain. (Leave your answer in terms of natural logarithms.)

(6) EXTRA CREDIT: Integrate \[ \int \csc^3 x \, dx \]