

## Review 1

### 1. True or False

- a)  $\ln e^{(x^2)} = 2 \ln e^x$       b)  $x^{\ln 2} = 2^{\ln x}$ ,  $x > 0$       c)  $\lim_{x \rightarrow 1} \ln x^2 = 1$
- d)  $\frac{d}{dx} \int \tan^{-1} x \, dx = \int \frac{dx}{1+x^2}$       e)  $e^{\sqrt{x}[(\ln 2x)^5]} = (2x)^{5\sqrt{x}}$ ,  $x > 0$
- f)  $e^{\ln|x|} = x$ ,  $x \neq 0$       g)  $\ln(0.03) = \frac{1}{3} \ln 27 - 2 \ln 10$
- h)  $(\cos hx)^{\sin x} = e^{\sin x \ln(\cos hx)}$

### 2. Find $\frac{dy}{dx}$

- a)  $y = \ln(x + \sqrt{x^2 + 1})$       b)  $y = 3^{\frac{1}{x}}$       c)  $y = \sqrt[3]{\frac{(x-1)^2(x+3)}{(x-2)(x+4)^4}}$
- d)  $y = \cot^{-1}(1+x^2)$       e)  $y = (\cos hx)^x$       f)  $y = \sec^{-1}(e^x)$
- g)  $y = \cot h(x)$       h)  $y = \ln[\cos^{-1}(x^2 - 1)]$

### 3. Find

- a)  $\int \frac{\sin x \, dx}{\sqrt{9 - 4 \cos^2 x}}$       b)  $\int \frac{(1 + \cos x)}{\sin x + x}$       c)  $\int \frac{dt}{\sqrt{e^{4t} - 1}}$
- d)  $\int \frac{dz}{3 + 5z^2}$       e)  $\int \frac{dx}{\ln(x^x)}$       f)  $\int \sin^4 x \cos^5 x \, dx$
- g)  $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \cos^2 x \, dx$       h)  $\int \frac{dx}{(5 - x^2)^{\frac{3}{2}}}$

### 4. Find

- a)  $\cos \tan^{-1}(-1)$       b)  $\sin^{-1} \sin(5)$       c)  $\sec^{-1} \tan(-\frac{\pi}{4})$       d)  $\cot \csc^{-1} 3$

### 5. Find the solution to the differential equation

$$(x^2 + 1) \frac{dy}{dx} - 2x(y^2 + 1) = 0$$

where  $y(0) = 1$ .

### 6. A radioactive substance decays at a rate proportional to the amount present. Initially the mass of the substance was 400 grms and in two years the mass decreased to 100 grms.

- a) Find a formula for the mass at time  $t$ .
- b) What will the mass be at four years?
- c) When will the mass be 20 grms?

Note: Your answers may be written in terms of logarithms.