Some Random Review of Calculus

(1) Use any appropriate derivative rules to find the derivative of the indicated function.

(a) $y = \sqrt{x^3 + 1}$

(b) $f(x) = \cot(e^{2x})$

(c) $g(t) = t^2 \sin(t)$

(d) $y = \sec^3(x)$

(e) $y = \ln(x^3+2x+1)$

(f) $f(x) = \dfrac{x}{\sin x + 1}$

(g) $h(x) = \dfrac{\ln x}{x}$

(h) $y = \sqrt[4]{x^5}$

(i) $f(x) = \sin^{-1}(x+1)$

(j) $h(t) = (\tan^{-1} t)^2$

(k) $y = \dfrac{x^3 - 1}{\sqrt{x}}$ Think on this. You don't need the quotient rule!

(2) Find the first, second and third derivative of

(a) $y = xe^x$

(b) $f(x) = \tan x$

(3) Find the indicated derivative.

(a) $x^3y^2 = e^x + e^y$, find $\dfrac{dy}{dx}$

(b) $y\tan(y) = x\sin(x)$, find $\dfrac{dy}{dx}$

(1) Evaluate the given integrals.

(a) given $\displaystyle\int_0^1 g(x)\,dx = 1$, and $\displaystyle\int_0^2 g(x)\,dx = 7$, evaluate $\displaystyle\int_1^2 g(x)\,dx$

(b) $\displaystyle\int_{-1}^{2} (x^2+3x-1)\,dx$

(c) $\displaystyle\int \tan^3 \frac{x}{2} \sec^2 \frac{x}{2}\,dx$

(d) $\displaystyle\int_{0}^{\frac{\pi}{6}} \frac{\sin 2x}{\cos^4 2x}\,dx$

(e) $\displaystyle\int_{1}^{4} \frac{dy}{2\sqrt{y}(1+\sqrt{y})^2}$

(f) $\displaystyle\int \frac{x^3}{\sqrt{x^4+1}}\,dx$

(g) $\displaystyle\int (\sec x - \csc(2x))\,dx$

(h) $\displaystyle\int_{-3}^{-1} \frac{x-4}{x^2}\,dx$

(i) $\displaystyle\int 3\cot w\,dw$

(j) $\displaystyle\int \left(\frac{1}{\sqrt{1-x^2}} + \frac{2}{1+4x^2}\right)dx$

(k) $\displaystyle\int \frac{2x+1}{x^2+x+2}\,dx$

(2) A particle moves along the x-axis; it's acceleration $a(t)$, initial velocity $v(0)$, and initial position $s(0)$ are given by

$$a(t) = 2\cos t \quad \text{ft/s}^2, \quad v(0) = 2 \quad \text{ft/s}, \quad \text{and} \quad s(0) = 0 \quad \text{ft.}$$

Find the position $s(t)$ for all $t > 0$.

(3) Evaluate each integral using any applicable method.

(a) $\displaystyle\int x\sec^2 x\,dx$

(b) $\displaystyle\int 2xe^{x^2}\,dx$

(c) $\displaystyle\int 2xe^{x}\,dx$

(d) $\displaystyle\int \sin^2\theta\,d\theta$

(e) $\displaystyle\int \tan^{-1} t\, dt$

(f) $\displaystyle\int \sec^4 x \tan x\, dx$

(g) $\displaystyle\int \cos^3 t \sin^2 t\, dt$

(h) $\displaystyle\int \sqrt{\cot x} \csc^2 x\, dx$

(4) Evaluate the integral by first using a substitution and then integration by parts.

$$\int e^{\sqrt{x}}\, dx$$

(5) Evaluate the given integrals using any applicable method.

(a) $\displaystyle\int \frac{\sqrt{x^2-9}}{x}\, dx$

(b) $\displaystyle\int \frac{dy}{\sqrt{16-y^2}}$

(c) $\displaystyle\int \frac{dx}{x^2-1}$

(d) $\displaystyle\int \frac{x^3}{\sqrt{x^2+1}}\, dx$

(e) $\displaystyle\int \frac{x^2+7x+2}{(x^2+1)(x+3)}\, dx$

(f) $\displaystyle\int_0^1 \sqrt{1-x^2}\, dx$

(6) Find the form of the partial fraction decomposition. (It is not necessary to find any of the coefficients A, B, etc.)

(a) $\displaystyle\frac{2x}{x^2+7x+12}$

(b) $\displaystyle\frac{x^2+2x-1}{(x^2-2x+1)(x^2-4)}$

(c) $\displaystyle\frac{1}{(x+2)^3(x^2-1)^2(x^2+4)^3}$