DERIVATIVE PRACTISE SHEET
MATH 103 DW
TEST #2

(1) Find the derivative & simplify your answer completely. Then find the 2nd derivative.

(a) $g(t) = \dfrac{2t^3 - 4t + 1}{\sqrt{t}}$

(b) $f(x) = (x+1)^2(x+3)^3$

(c) $f(t) = t^3(2t+3)^2$

(d) $g(t) = \dfrac{(4t-7)^2}{(5t+1)^4}$ (* Do not find 2nd derivative here)

(e) $f(x) = \left(\dfrac{x+2}{x-5}\right)^3$

(2) Find the derivative.
(No simplification required)

(a) $f(x) = x^2 \cos x$

(b) $f(x) = \dfrac{\sin x}{x^3+1}$

(c) $g(t) = t^2 + \sqrt{\sin t}$

(d) $g(t) = \dfrac{t^2 \sin t}{\cos t}$

(e) $g(t) = e^{t^2 \sin t}$

(f) $f(x) = (x^3 + 2x)e^{x^4}$

(g) $g(t) = \tan(e^{t^2})$

(h) $f(x) = \dfrac{e^x + e^{-x}}{2}$

(i) $f(x) = e^{\sin(e^x)}$

(j) $f(x) = \sin(\cos(x^3))$

(k) $f(x) = [x^2 \sin x]^5$

(l) $f(x) = \sqrt{x \cos x}$

(m) $f(x) = \sqrt{\dfrac{x^3 + 2}{\cos x}}$

(n) $f(x) = e^{\sqrt{\sin x}}$

(o) $f(x) = \cos(e^{x^3 + 2x})$

(p) $f(x) = \dfrac{\cos(e^x)}{xe^x}$

(q) $f(x) = (\cos x)(e^{\sin x})$

(R) $g(x) = [e^{x^2}\sin x]^7$

(S) $h(x) = e^{\sqrt[3]{x}} + x\sin x$

(T) $f(t) = e^{-t}(\sin(t^3))$

(U) $f(x) = \sec^2(x)$

(V) $f(x) = e^{\sec^2(x)}$

(W) $f(x) = \dfrac{1}{e^x}$

(X) $f(x) = \left[\dfrac{2x^2}{\sin x}\right]^{1/3}$

(Y) $f(x) = \dfrac{1}{(e^x\sin x)^2}$

(Z) $f(x) = e^{\left(\frac{x^3+2}{\sqrt{x}}\right)}$

$\boxed{\text{ANSWERS}}$

(1) (a) $g'(t) = 5t^{3/2} - 2t^{-1/2} - \frac{1}{2}t^{-3/2}$

$g''(t) = \frac{15}{2}t^{1/2} + t^{-3/2} + \frac{3}{4}t^{-5/2}$

(b) $f'(x) = (x+3)^2(x+1)(5x+9)$

$f''(x) = 4(x+3)(5x^2+18x+15)$

(c) $f'(t) = t^2(2t+3)(10t+9)$

$f''(t) = 80t^3 + 144t^2 + 54t$

(d) $g'(t) = \dfrac{4(4t-7)(-10t+37)}{(5t+1)^5}$

(e) $f'(x) = \dfrac{-21(x+2)^2}{(x-5)^4}$ $f''(x) = \dfrac{42(x+9)(x+2)}{(x-5)^5}$

(2) (a) $f'(x) = 2x\cos x - x^2\sin x$

(b) $f'(x) = \dfrac{(x^3+1)\cos x - 3x^2(\sin x)}{(x^3+1)^2}$

(c) $g'(t) = 2t + \frac{1}{2}(\sin t)^{-1/2}\cos t$

(d) $g'(t) = \dfrac{(2t\sin t + t^2\cos t)\cos t + \sin t\,(t^2\sin t)}{\cos^2 t}$

OR

$g'(t) = 2t\tan t + t^2\sec^2 t$

(e) $g'(t) = e^{t^2\sin t}\left[2t\sin t + t^2\cos t\right]$

(f) $f'(x) = (3x^2+2)e^{x^4} + e^{x^4}(4x^3)(x^3+2x)$

(g) $g'(t) = \sec^2(e^{t^2}) \cdot e^{t^2} \cdot 2t$

(h) $f'(x) = \frac{1}{2}(e^x - e^{-x})$

(i) $f'(x) = e^{\sin(e^x)} \cdot \cos(e^x) \cdot e^x$

(j) $f'(x) = \cos(\cos(x^3)) \cdot (-\sin(x^3))(3x^2)$

(k) $f'(x) = 5(x^2\sin x)^4\left[2x\sin x + x^2\cos x\right]$

(L) $f'(x) = \frac{1}{2}(x\cos x)^{-1/2}(\cos x - x\sin x)$

(M) $f'(x) = \frac{1}{2}\left(\dfrac{x^3+2}{\cos x}\right)^{-1/2}\left(\dfrac{3x^2\cos x + (x^3+2)\sin x}{\cos^2 x}\right)$

(N) $f'(x) = e^{\sqrt{\sin x}} \cdot \frac{1}{2}(\sin x)^{-1/2} \cdot \cos x$

(O) $f'(x) = -\sin\left(e^{x^3+2x}\right) \cdot e^{x^3+2x} \cdot 3x^2+2$

(P) $f'(x) = \dfrac{-\sin(e^x)e^x\, x e^x - (e^x + xe^x)\cos(e^x)}{x^2 e^{2x}}$

(Q) $f'(x) = (-\sin x)e^{\sin x} + e^{\sin x}\cos^2 x$

(R) $g'(t) = 7\left[e^{x^2}\sin x\right]^6 \cdot \left(e^{x^2} \cdot 2x\sin x + e^{x^2}\cos x\right)$

(S) $h'(x) = e^{\sqrt[3]{x}}\, \frac{1}{3}x^{-2/3} + (\sin x + x\cos x)$

(t) $f'(t) = -e^{-t}(\sin(t^3)) + \cos(t^3)3t^2 e^{-t}$

(U) $f'(x) = \dfrac{-2}{\cos^3 x}$

(V) $f'(x) = e^{\sec^2 x}\left(\dfrac{-2}{\cos^3 x}\right)$

(W) $f'(x) = -e^{-x}$

(X) $f'(x) = \dfrac{1}{3}\left(\dfrac{2x^2}{\sin x}\right)^{-2/3}\left(\dfrac{4x\sin x + 2x^2\cos x}{\sin^2 x}\right)$

(Y) $f'(x) = -2(e^x\sin x)^{-3}(e^x\sin x + e^x\cos x)$

(Z) $f'(x) = e^{\frac{x^3+2}{\sqrt{x}}} \cdot \left(\frac{5}{2}x^{3/2} - x^{-3/2}\right)$