Computing Derivatives – ANSWERS

(1) $y' = 2(x^3+1)(3x^2) = 6x^2(x^3+1)$

(E)

(2) $f'(x) = \left(\dfrac{1}{x+4+e^{-3x}}\right)(1-3e^{-3x})$ so $f'(0) = \dfrac{1}{0+4+e^0}(1-3e^0) \Rightarrow \dfrac{1}{4+1}(1-3) = \dfrac{1}{5}(-2)$

(A)

(3) $f'(x) = \sec^2(2x)(2) = 2\sec^2(2x)$ so $f'\left(\frac{\pi}{6}\right) = 2\left(\sec\frac{\pi}{3}\right)^2 = 2(2)^2 = \underline{8}$

(E) $\cos\frac{\pi}{3} = \frac{1}{2}$ so $\sec\frac{\pi}{3} = 2$

(4) $y' = x^2 \cdot \cos 2x(2) + \sin 2x(2x)$ so $2x^2\cos 2x + 2x\sin 2x = 2x(x\cos 2x + \sin 2x)$

(E)

(5) $y' = \dfrac{(3x+2)(2)-(2x+3)(3)}{(3x+2)^2} = \dfrac{6x+4-6x-9}{(3x+2)^2} = \dfrac{-5}{(3x+2)^2}$

(D)

(6) Rewrite $f(x)$ as $f(x) = x(2x-3)^{1/2}$. Now find $f'(x)$

(A) $f'(x) = x \cdot \frac{1}{2}(2x-3)^{-1/2}(2) + (2x-3)^{1/2}(1)$ so $\dfrac{x}{\sqrt{2x-3}} + \left(\sqrt{2x-3}\right) = $ multiply by $\dfrac{\sqrt{2x-3}}{\sqrt{2x-3}}$ $\dfrac{x+2x-3}{\sqrt{2x-3}} = \dfrac{3x-3}{\sqrt{2x-3}}$

(7) To find slope, take der. implicitly. $6y \cdot y' - 4x = 0 - (2xy' + 2y)$ put in $(3,2)$

(B) $12y' - 12 = -6y' - 4$ so $18y' = 8$ $y' = \frac{4}{9}$

(8) Need to take 2 der. $2x + 2yy' = 0 \Rightarrow y' = -\frac{x}{y}$ Now $y'' = \dfrac{y(-1)-(-x)y'}{y^2}$ got to fix y'

(A) $y' = -\frac{x}{y}$ $y'' = \dfrac{-y + x\left(-\frac{x}{y}\right)}{y^2}$ $y'' = \dfrac{-3+4\left(\frac{-4}{3}\right)}{9} = \dfrac{-3-\frac{16}{3}}{9} \cdot \dfrac{3}{3} = \dfrac{-9-16}{27} = \dfrac{-25}{27}$

use $(4,3)$

(9) May be too early for this problem for the kids. In case it's not, this is the

(D) other FTC. $\dfrac{d}{dx}\displaystyle\int_0^x \sqrt{t^3+1}\,dt = \sqrt{x^3+1}$ put in 2 for x $\Rightarrow \sqrt{9} = 3$

because asked to find $F'(2)$

(10) Another FTC get $\sin(x^2)^3(2x) = 2x\sin x^6$

(E) * Make sure you take der of x^2 *

(11) Another FTC because asked to find $g'(3)$. So $\dfrac{d}{dx}\displaystyle\int_0^{2x} f(t)\,dt \Rightarrow f(2x)(2)$

(C) $g'(3) = 2f(6) \Rightarrow 2(-1) = \underline{-2}$

(12) <u>Know</u> how to find der. of $h(x) = f(g(x))$

(D) $h'(x) = f'(g(x))\,g'(x)$

$h'(1) = f'(g(1))\,g'(1)$ so $f'(-1) \cdot 2 \Rightarrow 5(2) = \underline{10}$

$g(1) = -1$ $g'(1) = 2$ $f'(-1) = 5$