(2) $y = e^x \cos(x)$

$y' = e^x \cos(x) - e^x \sin(x) = \boxed{e^x(\cos(x) - \sin(x))}$

$y'' = e^x(\cos(x) - \sin(x)) + e^x(-\sin(x) - \cos(x))$

$= \boxed{-2e^x \sin(x)}$

$y''' = -2e^x \sin(x) - 2e^x \cos(x)$

$= \boxed{-2e^x(\sin(x) + \cos(x))}$

$y^{(4)} = -2e^x(\sin(x) + \cos(x)) - 2e^x(\cos(x) - \sin(x))$

$= \boxed{-4e^x \cos(x)}$

Chapter 23

(2) $\frac{d}{dx}[\cos(x^2)] = \boxed{-\sin(x^2)\,2x}$

(16) $\frac{d}{dx}\left[\sqrt{x^2+1}\right] = \frac{d}{dx}\left[(x^2+1)^{\frac{1}{2}}\right]$

$= \frac{1}{2}(x^2+1)^{-\frac{1}{2}}\,2x = \frac{x}{(x^2+1)^{\frac{1}{2}}} = \boxed{\frac{x}{\sqrt{x^2+1}}}$

(20) $\frac{d}{dx}\left[\left(\frac{x^2}{e^x+1}\right)^{100}\right] = 100\left(\frac{x^2}{e^x+1}\right)^{99}\frac{d}{dx}\left[\frac{x^2}{e^x+1}\right]$

$$= \boxed{100\left(\frac{x^2}{e^x+1}\right)^{99}\frac{2x(e^x+1)-x^2e^x}{(e^x+1)^2}}$$

(32) $\frac{d}{dx}\left[\cos(\tan(x^3))\right] = -\sin(\tan(x^3))\frac{d}{dx}\left[\tan(x^3)\right]$

$$= \boxed{-\sin(\tan(x^3))\sec^2(x^3)\,3x^2}$$

(38) If $g(x) = (f(x))^5$, then $g'(x) = 5(f(x))^4 f'(x)$

Then $g'(-2) = 5(f(-2))^4 f'(-2)$

$= 5\cdot 2^4(-1)$ ← (from graph)

$= \boxed{-80}$

(40) $h(x) = f(g(x))$ so $h'(x) = f'(g(x))g'(x)$.

Thus $h'(3) = f'(g(3))\,g'(3)$

$= f'(4)\cdot(-3) = (0.5)(-3) = \boxed{-\frac{3}{2}}$

(from chart)