⑤ b) $f(x) = \frac{1}{\sqrt{x}} + 2\sqrt{x} = x^{-1/2} + 2 \cdot x^{1/2}$

$$f'(x) = -\frac{1}{2\sqrt{x^3}} + \frac{1}{\sqrt{x}} = \frac{-1}{2x\sqrt{x}} + \frac{1}{\sqrt{x}}$$

c) $f(x) = \sqrt{x} \cdot \log x = (x)^{1/2} \cdot \log x$

$$f'(x) = \frac{1}{2\sqrt{x}} \cdot \log x + \sqrt{x} \cdot \frac{1}{x \ln 10} = \frac{\log x}{2\sqrt{x}} + \frac{\sqrt{x}}{x \ln 10}$$

$$= \frac{\log x}{2\sqrt{x}} + \frac{1}{\sqrt{x} \cdot \ln 10}$$

d) $f(x) = \ln x - (x^2 + 1)$

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

e) $f(x) = 3x^2 \cdot \sqrt{x}$

$$f'(x) = 6x \cdot \sqrt{x} + \frac{3x^2}{2\sqrt{x}}$$

f) $f(x) = (2x + 1)\ e^x$

$$f'(x) = 2 \cdot e^x + (2x+1) \cdot e^x = e^x [2x+3]$$

g) $f(x) = x^3 \cdot e^x$

$$f'(x) = 3x^2 e^x + x^3 \cdot e^x = e^x [3x^2 + x^3]$$

h) $f(x) = (x^2 + 5) \cdot \ln x$

$$f'(x) = 2x \cdot \ln x + \frac{(x^2 + 5)}{x}$$

i) $f(x) = \frac{\ln x}{x}$

$f'(x) = \frac{\frac{1}{x} \cdot x - \ln x \cdot 1}{x^2} = \frac{1 - \ln x}{x^2}$

j) $f(x) = 2x^2 \cdot (\sqrt{x} + 4)$

$f'(x) = 4x \cdot (\sqrt{x} + 4) + 2x^2 \cdot \left(\frac{1}{2\sqrt{x}}\right) =$

$= 4x\sqrt{x} + 16x + \sqrt{x^3}$

k) $f(x) = kx^2 \cdot e^x$

$f'(x) = 2kx \cdot e^x + kx^2 \cdot e^x = e^x [2kx + kx^2$

l) $f(x) = ((kx)^2 + S) \cdot \ln kx$

$f'(x) = 2k^2x \cdot \ln kx + ((kx)^2 + S) \cdot \frac{1}{kx}$

$f'(x) = 2k^2 x \cdot \ln(kx) + \frac{(kx)^2 + S}{kx}$

(6) a) $y = \frac{3}{4} \cdot \sqrt[3]{4x} = \frac{3}{4}(4x)^{1/3}$

$y' = \frac{3}{4} \cdot \frac{1}{3}(4x)^{-2/3} = \frac{1}{4\sqrt[3]{x^2}}$

b) $f(x) = \sqrt{2x} + 2\sqrt{x} = (2x)^{1/2} + 2 \cdot (x)^{1/2}$

$y' = \frac{1}{2} \cdot (2x)^{-1/2} + 2 \cdot \frac{1}{2} \cdot x^{-1/2} = \frac{1}{2\sqrt{2x}} + \frac{1}{\sqrt{x}}$

c) $y = x \cdot \sqrt{x^2-1} = x \cdot (x^2-1)^{1/2}$

$y = \sqrt{x^2-1} + x \cdot \frac{1}{2(x^2-1)^{1/2}} \cdot 2x = \sqrt{x^2-1} + \frac{x^2}{\sqrt{x^2-1}}$

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

$y' = \frac{1}{x^3+2} \cdot 3x^2 = \frac{3x^2}{x^3+2}$

e) $y = \log(\sqrt{x})$

$y' = \frac{1}{\sqrt{x} \cdot \ln 10} \cdot \frac{1}{2\sqrt{x}} = \frac{1}{x \ln 10}$

f) $f(x) = x^2 \cdot e^{2x+1}$

$f'(x) = 2x \cdot e^{2x+1} + x^2 \cdot e^{2x+1} \cdot 2 =$

$= e^{2x+} \left[2x + 2x^2\right]$

g) $f(x) = 3x^2 \cdot \sqrt{x^2+1}$

$f'(x) = 6x \cdot \sqrt{x^2+1} + 3x^2 \cdot \frac{1}{2\sqrt{x^2+1}} \cdot 2x =$

$= 6x\sqrt{x^2+1} + \frac{x^3}{\sqrt{x^2+1}}$

h) $f(x) = x^3 \cdot e^{-3x} = \frac{x^3}{e^{3x}}$

$f'(x) = \frac{3x \cdot e^{3x} - x^3 \cdot e^{3x} \cdot 3}{(e^{3x})^2} = \frac{e^{3x}\left[3x - 3x^3\right]}{e^{6x}} =$

$$f'(x) = \frac{[3x - 3x^3]}{e^{3x}} = [3x - 3x^3]\, e^{-3x} \quad (4)$$

i) $f(x) = \sqrt{\ln x}$

$$f'(x) = \frac{1}{2\ln x} \cdot \frac{1}{x} \cdot 1 = \frac{1}{2x \ln x}$$

j) $f(x) = \ln \sqrt{x}$

$$f'(x) = \frac{1}{\sqrt{x}} \cdot \frac{1}{2\sqrt{x}} = \frac{1}{2x}$$

k) $y = \frac{\ln x^2}{x}$

$$y' = \frac{2x \cdot x - \ln x^2 \cdot 1}{x^2} = \frac{2 - \ln x^2}{x^2}$$

l) $y = \sqrt[3]{2x-5} = (2x-5)^{1/3}$

$$y' = \frac{1}{3}(2x-5)^{-2/3} \cdot 2 = \frac{2}{3\sqrt[3]{(2x-5)^2}}$$

m) $f(x) = 2x^2 \cdot \sqrt{2-x}$

$$f'(x) = 4x \cdot \sqrt{2-x} + 2x^2 \cdot \frac{1}{2\sqrt{2-x}} \cdot (-1) =$$

$$= 4x\sqrt{2-x} - \frac{x^2}{\sqrt{2-x}}$$

n) $f(t) = \frac{-8}{(t+3)^3}$

$$f'(t) = \frac{0 \cdot (t+3)^3 + 8 \cdot 3(t+3)^2 \cdot 1}{(t+3)^6} =$$

$$= \frac{24}{(t+3)^4}$$

o) $f(x) = \frac{a^2 - x^2}{a^2 + x^2}$

$$f'(x) = \frac{-2x \cdot (a^2 + x^2) - (a^2 - x^2) \cdot 2x}{(a^2 + x^2)^2} =$$

$$= \frac{-2x\left[(a^2 + x^2) + (a^2 - x^2)\right]}{[a^2 + x^2]^2} =$$

$$= \frac{-2x \cdot 2a^2}{[a^2 + x^2]^2} = \frac{-4xa^2}{[a^2 + x^2]^2}$$