9) $f(x) = \frac{u}{v}$ $\quad u = 3 \quad u' = 0$

$v = 1 + 2x \quad v' = 2$

$$f'(x) = \frac{u'v - uv'}{v^2} = \frac{0 - 3 \times 2}{(1+2x)^2} = \frac{-6}{(1+2x)^2}$$

$g(x) = \frac{u}{v}$ $\quad u = x + 1 \quad u' = 1$

$v = x - 1 \quad v' = 1$

$$g'(x) = \frac{u'v - uv'}{v^2} = \frac{1(x-1) - (x+1) \times 1}{(x-1)^2} =$$

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

10) $f(x) = \ln(u)$ $\quad u = 3x + 1 \quad u' = 3$

$$f'(x) = \frac{u'}{u} = \frac{3}{3x+1}$$

$g(x) = 2x^2 + 3e^u$ $\quad u = 2x \quad u' = 2$

$$g'(x) = 4x + 3u'e^u = 4x + 6e^{2x}$$

11) $f(x) = 4e^u + 2e^x \qquad u = -x \quad u' = -1$

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

$g(x) = uv \qquad u = x \quad u' = 1$

$\qquad\qquad v = e^{-2x} \quad v' = -2e^{-2x}$

$g'(x) = u'v + uv' = e^{-2x} + x(-2e^{-2x}) =$

$= e^{-2x} - 2x\,e^{-2x} = e^{-2x}(1-2x)$

12) $f(x) = uv \qquad u = x+1 \quad u' = 1$

$\qquad\qquad v = e^{-x} \quad v' = -e^{-x}$

$f'(x) = u'v + uv' = e^{-x} + (x+1)(-e^{-x}) =$

$= \cancel{e^{-x}} - x\,e^{-x} - \cancel{e^{-x}} = -x\,e^{-x}$

$g(x) = e^u \qquad u = -\frac{x^2}{2} \quad u' = -\frac{2x}{2} = -x$

$g'(x) = u'e^u = -x\,e^{-\frac{x^2}{2}}$

13) $f(x) = \ln(u) \qquad u = x^2+1 \quad u' = 2x$

$f'(x) = \frac{u'}{u} = \frac{2x}{x^2+1}$

$$g(x) = e^u + 2\ln x \qquad u = -2x+1 \qquad u' = -2$$

$$g'(x) = u'e^u + 2 \times \frac{1}{x} = -2e^{-2x+1} + \frac{2}{x}$$

14) $f(x) = \frac{u}{v}$ $\qquad u = e^x + 1 \qquad u' = e^x$

$\qquad v = e^x - 1 \qquad v' = e^x$

$$f'(x) = \frac{u'v - uv'}{v^2} = \frac{e^x(e^x-1) - (e^x+1)e^x}{(e^x-1)^2} =$$

$$= \frac{\cancel{e^{2x}} - e^x - \cancel{e^{2x}} - e^x}{(e^x-1)^2} = \frac{-2e^x}{(e^x-1)^2}$$

$$g(x) = uv - \sqrt{x} \qquad u = x \qquad u' = 1$$

$$v = \sqrt{x} \qquad v' = \frac{1}{2\sqrt{x}}$$

$$g'(x) = u'v + uv' - \frac{1}{2\sqrt{x}} = \sqrt{x} + \frac{x}{2\sqrt{x}} - \frac{1}{2\sqrt{x}}$$

15) $f(x) = \frac{1}{u}$ $\qquad u = x+3 \qquad u' = 1$

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

$g(x) = \frac{u}{v}$ $\quad u = x+2 \quad u' = 1$

$v = 2x+1 \quad v' = 2$

$$g'(x) = \frac{u'v - uv'}{v^2} = \frac{2x+1 - (x+2)\times 2}{(2x+1)^2} =$$

$$= \frac{\cancel{2x}+1-\cancel{2x}-4}{(2x+1)^2} = \frac{-3}{(2x+1)^2}$$

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

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

$g(x) = \frac{u}{v}$ $\quad u = \ln x - 1 \quad u' = \frac{1}{x}$

$v = \ln x + 1 \quad v' = \frac{1}{x}$

$$g'(x) = \frac{u'v - uv'}{v^2} = \frac{\frac{1}{x}(\ln x+1) - (\ln x - 1)\frac{1}{x}}{(\ln x+1)^2} =$$

$$= \frac{\cancel{\ln x}+1-\cancel{\ln x}+1}{x(\ln x+1)^2} = \frac{2}{x(\ln x+1)^2}$$