8. $s(t) = (3t^2 + 4t + 1)^3$

Let $z = g(t) = 3t^2 + 4t + 1$

$s(z) = z^3$ $\qquad z = g(t) = 3t^2 + 4t + 1$

$s'(z) = 3z^2$ $\qquad g'(t) = 6t + 4$

$s'(t) = (3z^2)(6t+4) = 3(3t^2 + 4t + 1)^2 (6t+4)$

9. $w(r) = \sqrt{r^4 + 1}$

Let $z = g(r) = r^4 + 1$

$w(z) = \sqrt{z}$ $\qquad g(r) = r^4 + 1$

$w'(z) = \frac{1}{2} z^{-1/2}$ $\qquad g'(r) = 4r^3$

$w'(r) = \frac{1}{2} z^{-1/2} \cdot 4r^3 = \frac{1}{2}(r^4+1)^{-1/2} \cdot 4r^3$

10. $k(x) = (x^3 + e^x)^4$

$z = g(x) = x^3 + e^x$

$k(z) = z^4$ $\qquad g(x) = x^3 + e^x$

$k'(z) = 4z^3$ $\qquad g'(x) = 3x^2 + e^x$

$k'(x) = 4z^3 \cdot (3x^2 + e^x) = 4(x^3 + e^x)^3 \cdot (3x^2 + e^x)$

42. $h(x) = 2^{e^{3x}}$

Let $z = e^{3x} = g(x)$

$h(z) = 2^z$ $\qquad g(x) = e^{3x}$

Let $w = 3x \Rightarrow g(w) = e^w$, $g'(w) = e^w$ $\qquad m'(x) = 3$

$h'(z) = \ln(2) \cdot 2^z \cdot e^w \cdot 3 = \ln(2) \cdot 2^{e^{3x}} \cdot e^{3x} \cdot 3 = \ln(8) \cdot 2^{e^{3x}} \cdot e^{3x}$

36. $y = f(x) = \dfrac{e^x - e^{-x}}{e^x + e^{-x}} = \dfrac{(e^x + e^{-x})\frac{d}{dx}(e^x - e^{-x}) - (e^x - e^{-x})\frac{d}{dx}(e^x + e^{-x})}{(e^x + e^{-x})^2}$

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

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