DAY 49 p. 159 #2, 6, 8, 10, 22–26, 30, 31, 37, 39

(2) $f(x) = \ln(1-x)$

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

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

(6) $f(x) = \arctan(3x)$

$f'(x) = \frac{1}{1+(3x)^2} \cdot 3 = \frac{3}{(1+9x^2)}$

(8) $Q = a\ln(bx+c)$

$Q'(x) = \frac{a}{(bx+c)} \cdot b$

$Q'(x) = \frac{ab}{(bx+c)}$

(10) $f(x) = e^{\ln(e^{2x^2+3})} = e^{2x^2+3}$ Rewrite →

$f'(x) = (e^{2x^2+3})(4x)$

(22) $f(y) = \arcsin(y^2)$

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

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

(23) $s(x) = \arctan(2-x)$

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

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

(24) $g(\alpha) = \sin(\arcsin\alpha)$

$g(\alpha) = \alpha$

$g'(\alpha) = 1$

(25) $g(t) = e^{\arctan(3t^2)}$

$g'(t) = e^{\arctan(3t^2)} \cdot \frac{1}{(1+9t^4)} \cdot (6t)$

$g'(t) = \frac{(6t) \cdot e^{\arctan(3t^2)}}{(1+9t^4)}$

(26) $g(t) = \cos(\ln t)$

$g'(t) = -\sin(\ln t)\left(\frac{1}{t}\right)$

$g'(t) = \frac{-\sin(\ln(t))}{t}$

(30) $r(t) = \arcsin(2t)$

$r'(t) = \frac{1}{\sqrt{1-4t^2}} \cdot 2$

$r'(t) = \frac{2}{\sqrt{1-4t^2}}$

(31) $j(x) = \cos(\sin^{-1}(x))$

$j'(x) = -\sin(\sin^{-1}(x)) \cdot \left(\frac{1}{\sqrt{1-x^2}}\right)$

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

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(37) $f(x) = \ln(\sin x + \cos x)$

$$f'(x) = \left(\frac{1}{\sin x + \cos x}\right) \cdot (\cos x - \sin x)$$

$$f'(x) = \frac{\cos x - \sin x}{\sin x + \cos x}$$

(*) (39) $T(u) = \arctan\left(\frac{u}{1+u}\right)$

inner function derivative:

$$\frac{d}{du}\left(\frac{u}{1+u}\right) = \frac{1(1+u) - u(1)}{(1+u)^2} = \frac{1+u-u}{(1+u)^2} = \frac{1}{(1+u)^2}$$

$$T'(u) = \frac{1}{1 + \left(\frac{u}{1+u}\right)^2} \cdot \left(\frac{1}{(1+u)^2}\right)$$

Simplify

$$= \frac{1}{\left(1 + \frac{u^2}{(1+u)^2}\right) \cdot \left((1+u)^2\right)}$$

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

$$= \boxed{\frac{1}{1+2u^2}}$$