Task 15: Answers

1) $y = (3x-2)^2$

Let $u = 3x-2$ $\quad y = u^2$

$\frac{du}{dx} = 3$ $\quad \frac{dy}{du} = 2u$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$= 2u \times 3$$

$$= 6u$$

$$= 6(3x-2)$$

2) $y = (2x+3)^3$

Let $u = 2x+3$ $\quad y = u^3$

$\frac{du}{dx} = 2$ $\quad \frac{dy}{du} = 3u^2$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$= 3u^2 \times 2$$

$$= 6u^2$$

$$= 6(2x+3)^2$$

3) $f(x) = (4-5x)^4$

Let $u = 4-5x$ $\quad y = u^4$

$\frac{du}{dx} = -5$ $\quad \frac{dy}{du} = 4u^3$

$$f'(x) = \frac{dy}{du} \times \frac{du}{dx}$$

$$= 4u^3 \times (-5)$$

$$= -20u^3$$

$$= -20(4-5x)^3$$

4) $f(x) = \sqrt{2x+5}$

$f(x) = (2x+5)^{1/2}$

Let $u = 2x+5$ $\quad y = u^{1/2}$

$\frac{du}{dx} = 2$ $\quad \frac{dy}{du} = \frac{1}{2}u^{-1/2}$

$= \frac{1}{2\sqrt{u}}$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= \frac{1}{2\sqrt{u}} \times 2$

$= \frac{1}{\sqrt{u}}$

$= \frac{1}{\sqrt{2x+5}}$

5) Let $y = (7x+2)^{-3}$

Let $u = 7x+2$ $\quad y = u^{-3}$

$\frac{du}{dx} = 7$ $\quad \frac{dy}{du} = -3u^{-4}$

$= \frac{-3}{u^4}$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= \frac{-3}{u^4} \times 7$

$= \frac{-21}{u^4}$

$= \frac{-21}{(7x+2)^4}$

6) Let $y = \frac{1}{2x+7}$

$y = (2x+7)^{-1}$

Let $u = 2x+7$ $\qquad$ $y = u^{-1}$

$\frac{du}{dx} = 2$ $\qquad$ $\frac{dy}{du} = -u^{-2}$

$\frac{dy}{du} = \frac{-1}{u^2}$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= \frac{-1}{u^2} \times 2$

$= \frac{-2}{u^2}$

$= \frac{-2}{(2x+7)^2}$

7) $y = \frac{2}{(3x-1)^3} = 2(3x-1)^{-3}$

Let $u = 3x-1$ $\qquad$ $y = 2u^{-3}$

$\frac{du}{dx} = 3$ $\qquad$ $\frac{dy}{du} = -6u^{-4}$

$\frac{dy}{du} = \frac{-6}{u^4}$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= \frac{-6}{u^4} \times 3$

$= \frac{-18}{u^4}$

$= \frac{-18}{(3x-1)^4}$

8) $y = \frac{1}{\sqrt{2x+5}}$

$y = (2x+5)^{-1/2}$

Let $u = 2x+5$ $\qquad y = u^{-1/2}$

$\frac{du}{dx} = 2$ $\qquad \frac{dy}{du} = -\frac{1}{2}u^{-3/2}$

$= \frac{-1}{2\sqrt{u^3}}$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= \frac{-1}{2\sqrt{u^3}} \times 2$

$= -\frac{1}{\sqrt{u^3}}$

$= -\frac{1}{\sqrt{(2x+5)^3}}$

9) $f(x) = (2x-1)^9$

Let $u = 2x-1$ $\qquad y = u^9$

$\frac{du}{dx} = 2$ $\qquad \frac{dy}{du} = 9u^8$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= 9u^8 \times 2$

$= 18u^8$

$= 18(2x-1)^8$

10) $f(x) = \sqrt[3]{3x-2}$

$f(x) = (3x-2)^{1/3}$

Let $u = 3x-2$ $\qquad y = u^{1/3}$

$\frac{du}{dx} = 3$ $\qquad \frac{dy}{du} = \frac{1}{3}u^{-2/3}$

$\qquad\qquad\qquad\qquad = \frac{1}{3\sqrt[3]{u^2}}$

$f'(x) = \frac{dy}{du} \times \frac{du}{dx}$

$= \frac{1}{3\sqrt[3]{u^2}} \times 3$

$= \frac{1}{\sqrt[3]{u^2}}$

$= \frac{1}{\sqrt[3]{(3x-2)^2}}$