

Derive each:

$$1. y = \frac{3x^2 + 7x}{2} = \frac{3}{2}x^2 + \frac{7}{2}x$$

$$\boxed{y' = 3x + \frac{7}{2}}$$

$$2. y = \frac{x^2 + 1}{x + 5} \quad y' = \frac{(x+5)(2x) - (x^2+1)(1)}{(x+5)^2}$$

$$= \frac{2x^2 + 10x - x^2 - 1}{(x+5)^2}$$

$$= \boxed{\frac{x^2 + 10x - 1}{(x+5)^2}}$$

$$3. y = (2x^3 - 6x + 2)(3x^3 - 5x^2 + 7)$$

$$\boxed{y' = (2x^3 - 6x + 2)(27x^2 - 10x) + (3x^3 - 5x^2 + 7)(6x - 6)}$$

$$4. y = x \sin x$$

$$\boxed{y' = x \cos x + \sin x}$$

$$5. y = \frac{x^2 - 4}{x - 2} = \frac{\cancel{(x-2)}(x+2)}{\cancel{x-2}}$$

$$\boxed{y' = 1}$$

$$6. y = \frac{e^x}{\sin x} \quad y' = \frac{\sin x (e^x) - e^x \cos x}{\sin^2 x}$$

$$= \boxed{\frac{e^x \sin x - e^x \cos x}{\sin^2 x}}$$

$$7. y = \frac{5}{(7x)^2} = \frac{5}{49x^2} = \frac{5}{49}x^{-2} \quad y' = \frac{-10}{49}x^{-3} = \boxed{\frac{-10}{49x^3}}$$

$$8. y = \cos x \sec x = \cos x \left(\frac{1}{\cos x} \right) = 1$$

$$\boxed{y' = 0}$$

$$9. y = \sqrt{t}(1-t) = t^{1/2}(1-t)$$

$$y' = \frac{1}{2}t^{-1/2} - \frac{3}{2}t^{1/2} = t^{1/2} - t^{3/2}$$

$$= \boxed{\frac{1}{2\sqrt{t}} - \frac{3}{2}\sqrt{t}}$$

$$10. y = e^x \cot x$$

$$y' = -e^x \csc^2 x + \cot x (e^x)$$

$$= \boxed{-e^x \csc^2 x + e^x \cot x}$$

$$11. y = (2x-1)(3x+4) = 6x^2 + 5x - 4$$

$$\boxed{y' = 12x + 5}$$