Problem 1: $f(x) = 3x^2 + 5x - 7$

$f(x) = 3x^2 + 5x - 7$

$f'(x) = 6x + 5$

Problem 2: $f(x) = \sqrt{x}$

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

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

$= \frac{1}{2} \cdot x^{-\frac{1}{2}}$

$= \frac{1}{2} \cdot \frac{1}{x^{\frac{1}{2}}}$

$= \frac{1}{2} \cdot \frac{1}{\sqrt{x}}$

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

Problem 3: $f(x) = x^2 \sin(x)$

$f(x) = x^2 \sin(x)$

$f'(x) = (x^2)' \sin(x) + x^2 \sin'(x)$

$= 2x \sin(x) + x^2 \cos(x)$

Problem 4: $f(x) = \sin(3x^2 + 2x)$

Set $g(x) = 3x^2 + 2x$

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

$f(x) = \sin(3x^2 + 2x) = \sin(g(x))$

$f'(x) = f'(g(x)) \cdot g'(x)$

$= \sin'(g(x)) \cdot g'(x)$

$= \cos(3x^2 + 2x) \cdot 6x + 2$

Problem 5: $f(x) = e^2x$

$f(x) = e^{2x}$

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

$= 2e^{2x}$

Problem 6: $f(x) = \ln(x^2 + 1)$

$f(x) = \ln(x^2 + 1)$

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

$= \frac{2x}{x^2 + 1}$

Problem 7: $f(x) = \ln(x^2 + 1)$

$f(x) = \ln(x^2 + 1)$

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

$= \frac{2x}{x^2 + 1}$

Problem 8: $f(x) = \frac{\sin(x)}{\cos(x)}$

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

$f'(x) = \frac{\sin'(x)\cos(x) - \sin(x)\cos'(x)}{\cos^2 x}$

$= \frac{\cos(x)\cos(x) + \sin(x)\sin(x)}{\cos^2 x}$

$= \frac{\cos^2 x + \sin^2 x}{\cos^2 x}$

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

Problem 9: $f(x) = x^2e^x$

$f(x) = x^2e^x$

$f'(x) = (x^2)'e^x + x^2(e^x)'$

$= 2xe^x + x^2e^x$

$= e^x(x^2 + 2x)$