1. $y = \frac{1}{x} + \frac{2}{x^2} - \frac{5}{x^3} + \sqrt{x} - \sqrt[3]{x} + \frac{3}{\sqrt{x}}$

$y' = -x^{-2} - 4x^{-3} + 15x^{-4} + \frac{1}{2\sqrt{x}} - \frac{1}{3\sqrt[3]{x^2}} - \frac{3}{2x\sqrt{x}}$

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2. $y = x \cdot \sqrt{1+x^2}$

$y' = x \cdot \frac{1 \cdot 2x}{2\sqrt{1+x^2}} + \sqrt{1+x^2}$

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

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

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4. $y = \sqrt{x + \sqrt{x + \sqrt{x}}}$

$y' = \frac{1}{2\sqrt{x+\sqrt{x+\sqrt{x}}}} \cdot \left(1 + \frac{1}{2\sqrt{x+\sqrt{x}}}\right) \cdot \frac{1}{2\sqrt{x}}$

---

5. $y = (x^2+2)^5 \cdot (3x-x^3)^3$

$y' = (x^2+2)^5 \cdot (3x-x^3)^3 \cdot \left(\frac{5 \cdot 2x}{x^2+2} + \frac{3 \cdot (3-3x^2)}{(3x-x^3)}\right)$

---

6. $y = \sqrt[x]{x}$

$y' = \sqrt[x]{x} \cdot (\ln \sqrt[x]{x})' = \sqrt[x]{x} \cdot \frac{1 \cdot x^{\frac{1}{x}-1}}{\sqrt[x]{x} \cdot x}$

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

$y' = \frac{(2-x^2)^3 \cdot (x-1)^2}{(2x^3-3x) \cdot e^x} \cdot \left(\frac{3(-2x)}{2-x^2} + \frac{2}{x-1} - \frac{6x^2-3}{2x^3-3x} - 1\right)$

8. $\begin{cases} x = \frac{t^2}{t-1} \\ y = \frac{t}{t^2-1} \end{cases}$ $\begin{cases} x'_t = \frac{2t \cdot (t-1) - t^2}{(t-1)^2} \\ y'_t = \frac{t \cdot 2t - t^2 + 1}{(t^2-1)^2} \end{cases}$ $\begin{cases} x'_t = \frac{t^2-2t}{(t-1)^2} \\ y'_t = \frac{t^2+1}{(t^2-1)^2} \end{cases}$

$x'_y = \frac{(t^2-2t) \cdot (t^2-1)^2}{(t-1)^2 (t^2+1)}$

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10. $y = \ln(x + \sqrt{x^2+1})$

$y' = \frac{1 \cdot \left(1 + \frac{1}{2\sqrt{x^2+1}}\right) \cdot 2x}{x + \sqrt{x^2+1}} = \frac{2x \cdot (2\sqrt{x^2+1} + 1)}{(x+\sqrt{x^2+1}) \cdot 2\sqrt{x^2+1}}$

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11. $y = x \cdot \ln(x + \sqrt{x^2+1}) - \sqrt{x^2+1}$

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

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12) $y = \arcsin(\sin x)$

$y' = \frac{1}{\sqrt{1-\sin^2 x}} \cdot \cos x$

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13) $P = 2x + 2y = 144$

$y = 72 - x$

$S = (72-x) \cdot x$

$S' = 72 - 2x = 0$

$x = 36$

$y = 36$

$S = 1296$