In each case, find an expression for dy/dx.

1. $y = \dfrac{11}{2\sqrt{x^2 - x + 9}}$

   Treat $\frac{11}{2}$ as a constant and begin with the constant multiple rule. Then use the laws of exponents to rewrite the expression involving x. Then differentiate using the generalized power rule (special case of the chain rule).

2. $y = \left(\dfrac{\sqrt{x}}{x^3 - 1}\right)^7$

   Use the generalized power rule (special case of the chain rule).

3. $y = e^x + x^e + e$

   The first term is an exponential function, the second is a power function, the third is a constant.

4. $y = (x^2 + 1)\left(\sqrt[3]{x^2 + 3}\right)$

   Begin with the product rule.

5. $y = \dfrac{e^{\tan x}}{x^2 + x + 5}$

   Begin with the quotient rule.

6. $y = \sin^3(5x^2)$

   Rewrite $\sin^3(5x^2)$ as $(\sin(5x^2))^3$. The generalized power rule gets used first.

7. $\sin(xy) = x^2 - y$

   Use implicit differentiation.

8. $y = e^{2x} \sec(2x) \tan(2x)$

   Use the product rule, treating e^{2x} as the first function and $\sec(2x)\tan(2x)$ as the second function. Then use the product rule when differentiating the second function.

9. $x^2(x - y)^2 = x^2 - y^2$

   Use implicit differentiation. The product rule is used for the left hand side.

10. $y = \ln\left(\sqrt{\dfrac{(x+1)^5}{(x+2)^{20}}}\right)$

    First simplify using laws of logs. Then differentiation is easy!

11. $y = \sqrt[3]{\dfrac{x(x+2)}{x^2+1}}$

Take ln of both sides and simplify using laws of logs. Differentiation is now a breeze. Finally, use the original equation to substitute for y.

12. $y = \sqrt{x}\, e^{x^2-1}$

Begin with the product rule. The second function is an exponential function. The chain rule will be needed when differentiating the second function.

13. $y = \dfrac{t^3+5}{t\sqrt{t}}$

Don't rush to use the quotient rule! Observe that the expression can be simplified: distribute the denominator, then use laws of exponents to rewrite each of the two terms. Differentiate after you have done this.

14. $y = \dfrac{5(e^{2t}+e^{-2t})}{3(e^{2t}-e^{-2t})}$

Treat $\frac{5}{3}$ as a constant and begin with the constant multiple rule. Then use the quotient rule. The chain rule will be needed when differentiating the numerator as well as the denominator. A nice simplification is possible after differentiation is complete.