Find the derivatives of the following functions.
Remember that you can verify your answers by graphing.

1. $f(x) = \sec(x)$

$$f'(x) = \tan(x)\sec(x)$$

2. $f(x) = \sqrt{x}\cos(x)$

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

3. $f(x) = \dfrac{3\ln(x)}{e^x}$

$$f'(x) = \frac{3\left(\dfrac{1}{x} - \ln(x)\right)}{e^x}$$

4. $f(x) = \dfrac{4}{(x^3+25x)^3}$

$$f'(x) = -\frac{12(3x^2+25)}{(x^3+25x)^4}.$$

5. $f(x) = \dfrac{x\ln(x) - x}{5}$

$$f'(x) = \frac{1}{5}\ln(x)$$

6. $f(x) = \dfrac{\cot(x)}{3e^x}$

$$f'(x) = \frac{-\csc^2(x) - \cot(x)}{3e^x}$$

7. $f(x) = e^x \csc(x)(x^2+1)$

$$f'(x) = e^x[(x^2+1)\csc(x)(1-\cot(x)) + 2x\csc(x)]$$

8. $f(x) = \dfrac{x\cos(x)}{\ln(x)}$

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

9. $f(x) = e^{x^3\sin(x)}$

$$f'(x) = e^{x^3\sin(x)}[x^3\cos(x) + 3x^2\sin(x)]$$

10. $f(x) = \dfrac{(x^3+5x)^{100}}{\ln(x)}$

$$f'(x) = \frac{(x^3+5x)^{99}(\ln(x)(300x^2+500) - x^2 - 5)}{(\ln(x))^2}$$

11. $f(x) = \sec(x^3)$

$$f'(x) = 3x^2\sec(x^3)\tan(x^3)$$

12. $f(x) = \sqrt{\cos(x^4 - \dfrac{7}{x})}$

$$f'(x) = -\frac{1}{2}\left(\cos(x^4 - \frac{7}{x})\right)^{-1/2} \cdot \sin(x^4 - \frac{7}{x})(4x^3 + 7x^{-2})$$

13. $f(x) = \ln\left(\dfrac{x^3}{e^x}\right)$

$$f'(x) = \frac{3}{x} - 1$$

14. $f(x) = \tan(x^4)\sec^4(x)$

$$f'(x) = 4\sec^4(x)\left(\tan(x^4)\tan(x) + x^3\sec^2(x^4)\right)$$

15. $f(x) = \cos\left(\dfrac{1}{(x^2-5x)^4}\right)$

$$f'(x) = \frac{4(2x-5)\sin\left(\dfrac{1}{(x^2-5x)^4}\right)}{(x^2-5x)^5}$$

16. $f(x) = \dfrac{\ln(x^7)}{\cos(e^x)}$

$$f'(x) = \frac{\dfrac{7\cos(e^x)}{x} + e^x \ln(x^7)\sin(e^x)}{\cos^2(e^x)}$$

17. $f(x) = e^{\tan(\ln(x))}$

$$f'(x) = e^{\tan(\ln(x))} \cdot \sec^2(\ln(x)) \cdot \frac{1}{x}$$

18. $f(x) = x^{1/3}\sin(x)\sec(x)$

$$f'(x) = x^{1/3}(\tan(x))^2 + x^{1/3} + \frac{1}{3}x^{-2/3}\tan(x)$$