1. Compute the limit. $\lim_{x\to 3}(x^2+3x-1)$
2. Compute the limit. $\lim_{x\to 1}((x-1)\cos x)$
3. Compute $\lim_{x\to 2}\dfrac{3x^3+2x^2+3x-38}{x^2-3x+2}$.
4. Compute $\lim_{t\to -1}\dfrac{t^3+2t^2-4t-5}{t^3+t^2+t+1}$.
5. Explain why $\lim_{x\to -1}\dfrac{x+1}{|x+1|}$ does not exist.
6. Explain why $\lim_{x\to 0}\sin\dfrac{1}{x}$ does not exist.
7. Explain why $\lim_{x\to 1}\dfrac{x^2+3x+1}{x^2-3x+2}$ does not exist.
8. Use the definition of derivative to compute $f'(x)$ given that $f(x)=3x^2+2x-9$
9. Use the definition of derivative to compute $f'(x)$ given that $f(x)=\sqrt{x+2+3}$
10. Use the definition of derivative to compute $f'(x)$ given that $f(x)=\dfrac{1}{\sqrt[3]{x+1}}$
11. Let

$$f(x)=\begin{cases}\frac{\sin 3x}{x} & : \ x<0\\ \frac{\tan 2x}{x} & : \ 0<x\\ 0 & : \ x=0\end{cases}$$

Is f continuous at $x=0$? If so show why. If not, determine if 0 is a removable discontinuity.

12. Let

$$f(x)=\begin{cases}2x+c & : \ x<1\\ 5x-c & : \ 1\le x\end{cases}$$

Is there a value of c that makes f continuous at $x=1$? If so, find c. If not, show why.

13. Compute $\lim_{x\to 0}\dfrac{\tan x}{x}$.
14. Compute $\lim_{\theta\to 0}\dfrac{1-\cos^2\theta}{\theta^2}$.
15. Compute $\lim_{t\to 0}\dfrac{\sin(2t)}{3t}$.
16. Compute $\lim_{x\to 3^+} f(x)$ and $\lim_{x\to 3^-} f(x)$. Does $\lim_{x\to 3} f(x)$ exist? If so state how you know, if not state why.

$$f(x)=\begin{cases}\sin x & : \ x\le 0\\ x & : \ 0<x\le 3\\ x^2-4 & : \ x>3\end{cases}$$

17. The function $f(x)$ is given by $f(x)=\dfrac{x+\sin x}{x}$. Note that $f(0)$ is not defined. Is it possible to assign a value to $f(0)$ to make $f(x)$ continous at 0? If so, what should $f(0)$ be?
18. Is there a number c that makes the function f continuous, where f is defined below? If so, find c.

$$f(x)=\begin{cases}x^2+3 & : \ x\le 1\\ -2x^2+c & : \ x>1\end{cases}$$

19. Compute $\dfrac{d}{dx}(x^2\sin(2x))$
20. Compute $\dfrac{d}{dx}\dfrac{x^2+1}{x^2+x-4}$

21. Compute $\dfrac{d}{dx}(\tan(x^2+3))^3$

22. Compute $\frac{d}{dx}\sqrt[5]{(x^3+2)^2}$

23. Compute $\dfrac{d}{dx}\dfrac{\sin(2x-1)}{1+\sec x}$

24. Compute $\dfrac{d}{dx}\dfrac{\csc^2(x^2)+3}{\pi}$

25. Find an equation of the tangent line to $y = \sin^3 x \cos x$ at the point where $x = \frac{\pi}{4}$.

26. Find an equation of the tangent line to $y = x \sin x$ at the point where $x = \frac{\pi}{3}$.

27. Find an equation of the tangent line to $y = \sqrt{3x-2}$ at the point where $x = 6$.

28. Find equations for all the lines that pass through the point $(2, 10)$ and are tangent to the graph of $y = x^2 + 2x + 3$. (Note that the point is not on the graph.)

29. Find equations for all the lines that pass through the point $(1, 50/9)$ and are tangent to the graph of $y = \frac{10}{x}$. (Note that the point is not on the graph.)

30. Use the linearization of the appropriate function to estimate $\sqrt[3]{999}$.

31. Explain why radians are easier to use than degrees when doing a calculus problem.

32. Look at the first few derivatives of the function $f(x) = \frac{1}{x}$ and guess a formula for $f^{[n]}(x)$, the n^{th} derivative of $f(x)$.

33. Suppose that $f(x)$ is a polynomial of degree n with leading coefficient 7. (That is, the term with the highest power of x is $7x^n$.) Find a formula for the n^{th} derivative of $f(x)$.

34. Compute y' given that $x^4+y^4 = a^4$ where a is a constant. Find equations of the lines tangent to this graph at the points where $x = \dfrac{a}{\sqrt[4]{2}}$.

35. Compute $\frac{dy}{dx}$ given that $x^2y + y^2x - xy = 1$. Also find an equation of the tangent line through $(1, 1)$.

36. The position of an object along a line is given by $x(t) = 10t + \sin(3t)$ where t is measured in seconds and x is measured in meters. Find the object's velocity and acceleration at time t. State the units.

37. The velocity of an object is given by $v(t) = t^2 + 3t - 7$ where the distance units are feet and the time units are seconds. Find a formula for position and a formula for the acceleration and state the units for each.

38. The acceleration of an object is given by $a(t) = 28t$ where the distance unit is meters and the time unit is minutes. Find formulas for the velocity and position of the object. State the units of each.