1. Shifts and stretches: Graph \( y = 2\sin(x - \pi/2) - 1 \) by appropriately adjusting the graph of \( y = \sin x \).

2. Limits.
\[
\begin{align*}
\lim_{x\to3} & \frac{x^2 - 9}{x - 3} = \frac{27}{3} = 9 \\
\lim_{\theta\to0} & \frac{\tan 3\theta}{\sin \theta} = \tan 3\theta \\
\lim_{x\to\infty} & \frac{x - 2x^3}{x^3 + 2x + 5} \\
\lim_{t\to3^+} & \frac{3 - t}{|3 - t|} \\
\lim_{x\to2^-} & \frac{x}{x + 2} \\
\lim_{x\to3} & \frac{x - x}{x - 3} = 0 \\
\lim_{x\to1} & \frac{\sqrt{x + 1} - 1}{x - 1}
\end{align*}
\]

3. Continuity. For what value of the constant \( c \) is the function \( f \) continuous on \((-\infty, \infty)\)\(?)\(?
\[
f(x) = \begin{cases} 
5x & \text{if } x \leq 2 \\
 x^2 + c & \text{if } x > 2
\end{cases}
\]

4. Continuity. Find the numbers at which the function
\[
f(x) = \begin{cases} 
3 - x & \text{if } x \leq 0 \\
 x^2 - 1 & \text{if } 0 < x \leq 2 \\
x + 1 & \text{if } x > 2
\end{cases}
\]
is discontinuous. Sketch the graph of \( f \).

5. Find the derivative \( dy/dx \) of \( y = f(x) \) at \( x = 1 \) using the definition of derivative if
\[
f(x) = \sqrt{2x + 7}.
\]
or
\[
f(x) = \frac{2}{3x + 5}
\]

6. Product Rule. Differentiate \( y = x\tan x \). See page 140 of Stewart’s Essential Calculus. Determine what methods must be used.

7. Quotient Rule. Differentiate \( y = \frac{x^{1/3}}{\cos x + 6} \)

8. Chain Rule. Differentiate \( y = \frac{1}{(t^2 + t)^{1/3}} \)
9. Velocity: If a particle’s position is \( s(t) = 25 + 45t - t^2/2 + t^3/6 \) meters from the starting line at time \( t \) in seconds then what is the velocity?

10. Implicit Differentiation. Find \( dy/dx \) if \( x^2 + 4xy + y^2 = 13 \). Find an equation of the tangent line at (2,1).

11. Find \( dy/dx \) by implicit differentiation if \( \sqrt{xy} = 1 + x^2y \)

12. Tangent Lines: Find an equation for the tangent line to the curve \( y = \sec 3x \) at \( x = \pi/12 \)

13. Related Rates: P 131, 18, 20

14. Linear Approximation. \( L(x) = f(a) + f'(a)(x - a) \). Find the linear approximation to \( y = \sqrt{2x + 3} \) at \( x = 3 \).

15. Differentials: Find \( dy \) if \( y = 3 \csc x + \cot x \)

16. Absolute Maximum and Minimum on closed bounded intervals. Check for critical points in the interior and then check the endpoints. Compare the values of \( f(x) \) at the points \( x \) found. \( f(t) = t\sqrt{4 - t^2}, [-1.2]. \) Page 148 35-44. page 192, 1-4

17. Graphing. Page 192 9-18 13 or 14. \( y = 3x^5 - 5x^3 \)
   (a) Vertical and horizontal asymptotes.
   (b) Critical points \( f'(x) = 0 \) or \( f \) not differentiable.)
   (c) Intervals of increase and decrease.
   (d) Local max and min.
   (e) Inflection Points \( f''(x) = 0 \).
   (f) Intervals of concavity

18. Maximum and/or Minimum of \( f(x) \). First derivative test. Second derivative test. \( f(x) = 2/x + x^2 \).

19. Optimization. p 176-179, 4, 18

20. Antiderivatives: Page 189 3-28

21. Riemann Integrals. Page 203 6; Page 217, 32
22. Evaluate the integrals. Page 225 1-28; Page 241 7-44

\[
\int \frac{1}{x^{1/3}} \, dx, \quad \int_0^{\pi/8} \sec^2 2x \, dx, \quad \int \frac{x}{(1 + x^2)^3} \, dx
\]

23. Find \( g'(x) \) if \( g(x) = \int_2^x \tan \theta \, d\theta \) or \( g(x) = \int_x^{x^2} \sqrt{4 + t^3} \, dt \). Page 234 5-13

24. Displacement \( \int_0^3 t^2 - 4 \, dt \) and distance \( \int_0^3 |t^2 - 4| \, dt \). (Here the velocity is \( t^2 - 4 \).) (Page 226,55,56)

25. Find the area enclosed by the curve \( y = x^2 + 1 \), and lines \( x = -1 \), \( x = 2 \) and the \( x \)-axis.

26. If \( f(x) = x^3 + 2x - 3 \) then \( f \) is one-to-one. Find \( (f^{-1})'(0) \)

27. Simplify the expression: \( \log_3(\sqrt{3}/81) \), \( \arcsin(\sqrt{3}/2) \), \( \arccos(-1) \), \( \arctan(-1/\sqrt{3}) \) \( e^{-x+2\ln x} \).

28. Differentiate the function.
   
   (a) \( g(t) = \ln(2t + 5) + e^{7t} \)
   
   (b) \( f(x) = \ln \sqrt{\frac{2x + 1}{x - 1}} \)
   
   (c) \( h(s) = 5^s + \log_5 s^9 \)
   
   (d) \( g(x) = \arcsin(x/2) + \arctan(x^2) \)

29. Evaluate the integral.

\[
\int e^x / (e^x + 3) \, dx, \quad \int_0^4 3^x \, dx
\]