

BC Calculus
Test # 1 (1–40) Review

18. A) Find the domain and range of $f(g(x))$ if $f(x) = 3 + \cos x$ and $g(x) = x - \frac{\pi}{4}$.
- B) Find the domain and range of $f(g(x))$ if $f(x) = x^{1/2}$ and $g(x) = 3x + 2$.
19. Use the **definition of derivative** to find $f'(x)$ if $f(x) = \frac{-1}{x}$.
20. A) Evaluate: $3\log_7 13 + 9\log_{12} 21$.
- B) Write the two equations that must be used to graph $x^2 + y^2 = 16$ on a graphing calculator. Confirm your answer by graphing the circle using the two equations you just wrote.
21. Graph $f(x)$, $f(x + 2)$, and $f(x) + 2$ if $f(x) = |x|$.
22. The 4th term in the expansion of $(2x - 3y)^{12}$ is:
23. A) Solve: $\sin 4x - \frac{\sqrt{3}}{2} = 0 \quad 0 \leq x \leq \pi$
- B) Identify the conic section whose equations is $4x^2 + 9y^2 - 24x - 36y + 36 = 0$. Write the equations that must be used to graph this conic on a graphing calculator. Graph the equations you wrote to confirm them.
24. Find $s'(t)$ if $s(t) = \sqrt{t} + t^{-2} - \frac{1}{\sqrt[3]{t^2}}$.
25. Find $\frac{dy}{dx}$ if $y = 4x^{-1} - 3x^{\sqrt{3}} + 6x^\pi$.
26. A) Find y' if $y = 3 \ln x + 2 \sin x - 6e^x - 7 \cos x$.
- B) Find the half life of a substance that decays exponentially if on October 3 there was 300 g and on October 27 there was only 250 g.
27. A) Find $f'''\left(\frac{\pi}{3}\right)$ if $f(x) = \cos x$.
- B) Find $\left.\frac{d^2y}{dx^2}\right|_2$ if $y = 3x^3 + 2x^2 + x + 4$.
- C) Find the equation of the line tangent to $y = \ln x$ when $x = 3$.

28. A) Sketch $y = \frac{x(x+3)(3-x)}{(x+5)(x+3)(x-2)(x-5)}$. B) Find $\lim_{h \rightarrow 0} \frac{\sin\left(\frac{\pi}{6} + h\right) - \sin\frac{\pi}{6}}{h}$
29. A) Find dy if $y = 3x^{-2} - 4 \ln t + 6 \cos u - k^{2/5}$.
 B) Find $f'(5.18)$ if $f(x) = (2.17)^{x^2} + \log_5(2x)$.
30. Graph each function and its reciprocal on the same set of axes: A) $y = \frac{1}{2}x - 1$
 B) $y = x^2 + 4$
31. Find $\frac{dy}{dx}$ for each equation: A) $y = \sin x \cos x$ B) $y = e^x \sin x$ C) $y = x \ln x$
32. A) An antiderivative of $2x$ is: B) $\int \sin x \, dx =$ C) $\int \cos x \, dx =$
33. Sketch the graph of $y = (x-4)(x-2)^2(x^2+3)(x+5)^3(x+7)^2$.
34. A) Find $\frac{dy}{dx}$ if $xy + 3 = x^2y^3 - 2x$.
 B) Find the equation of the line that is tangent to $2x^2 - 3y^3 = 5$ at the point $(2, 1)$.
35. A) $\int 3 \cos x \, dx =$ B) $\int \frac{2}{3}x^4 \, dx =$ C) $\int x^e \, dx =$ D) $\int \frac{3}{5}\sqrt[3]{x^2} \, dx =$
36. A) Where does a derivative not exist?
 B) What is a stationary number?
 C) We always look for max/mins at _____, which are numbers where _____.
 D) Sketch the graph of $y = x^3 + \frac{9}{2}x^2 + 6x + 5$ by first finding the xy coordinates of all the max/mins and inflection points.
37. Find $\frac{dy}{dx}$ by using u -substitution if A) $y = (3x^2 + 6x - 3)^3$ B) $y = \sin(\ln x)$
 Find $\frac{dy}{dx}$ if C) $y = \ln(6x^{-3})$ D) $y = e^{\sin(x^2)}$
38. $\int \left(\frac{2}{7}x^{2/3} + 3e^x - 4 \sin x + \frac{2}{5}x^{-1} \right) dx =$
39. Estimate the area under $y = x^2 + 2$ on the interval $[-1, 2]$ by using 6 upper rectangles.
40. A) The slope of the line normal to $y = \cos(2x^2)$ at the point where $x = 1.7$ is:
 B) The position of a particle is given by $x(t) = 6t^3 - 4t^2 + 3t - 1$. What is the particle's acceleration at $t = 2$ seconds?