Calculus II Review Practice

Solutions provided online

Exercises

1. Evaluate each limit:

   (a) $\displaystyle\lim_{x\to 3} \frac{x^2 - 9}{x - 3}$.

   (b) $\displaystyle\lim_{x\to 0} \frac{\sin(5x)}{x}$.

   (c) $\displaystyle\lim_{x\to 0} \frac{1 - \cos x}{x^2}$.

   (d) $\displaystyle\lim_{x\to \infty} \frac{2x^3 - 5x + 1}{x^3 + 4x^2}$.

   (e) $\displaystyle\lim_{x\to 0} \frac{\ln(1 + 2x)}{x}$.

2. Let
$$f(x) = \begin{cases} x^2, & x \le 2, \\ mx + b, & x > 2. \end{cases}$$

   Find m and b so that f is *continuous and differentiable* at $x = 2$.

3. Differentiate $y = \dfrac{x^2 \sin x}{e^x}$.

4. Find the equation of the tangent line to $f(x) = \ln(x^2 + 1)$ at $x = 1$.

5. Compute the second derivative $f''(x)$ for $f(x) = \dfrac{1}{x^2 + 1}$.

6. Let $f(x) = x^3 + x + 1$. Compute $\left(f^{-1}\right)'(1)$. (Hint: Do not compute the inverse- if you know that (a, b) is on the graph of $f(x)$, and $f'(a) = m$, then what is $(f^{-1})'(b)$?)