

The following are all True/False questions.

1.  $\arctan(\tan(x)) = x$  for all real numbers  $x$ .
2.  $\sin(\arcsin(2)) = 2$ .
3.  $e^{\ln(x)} = x$  for all real numbers  $x$ .
4. If  $f(x)$  is differentiable and is increasing at  $x$ , then  $f'(x) > 0$ .
5. Suppose  $f'(x)$  is differentiable and is increasing at  $x$ . Then  $f$  is concave down at  $x$ .
6. If  $f$  is differentiable and there is an inflection point at  $x$ , then  $f'(x) = 0$ .
7. Suppose that  $f$  is continuous on  $[a, b]$ . Then  $f$  attains both an absolute minimum and an absolute maximum on  $[a, b]$ .
8. If  $f'(x)$  exists, there is a unique tangent line to the graph of  $f$  at the point  $x$ .
9. If  $x = a$  is a vertical asymptote of the function  $f$  at  $a$ , then either  $\lim_{x \rightarrow a} f(x) \text{ DNE } (+\infty)$  or  $\lim_{x \rightarrow a} f(x) \text{ DNE } (-\infty)$ .
10.  $\lim_{x \rightarrow \infty} f(x) \text{ DNE}$ , then  $f(x)$  must have a horizontal asymptote.

1. False.  $\tan(x)$  is not defined for all real numbers.
2. False. 2 is not in the domain of  $\arcsin(x)$ .
3. False. This is not true for  $x \leq 0$  because of the domain of  $\ln(x)$ .
4. True.
5. False.  $f$  is concave up at  $x$ .
6. False.  $f(x) = \sin(x)$  has an inflection point at  $x = 0$ , but  $f'(0) = 1$ .
7. True.
8. True.
9. False. Consider  $f(x) = \frac{1}{x}$  at  $x = 0$ .
10. False. Consider  $f(x) = x$ .