ELEMENTARY CALCULUS 1 - FALL 2024 - EXAM 4A - Solutions

20 minutes - no references. Each question worth two points. Total 50 points = half of Exam 4. $f(x)$ is a function. True or false:

T 1) A positive derivative at a point means the function is increasing

T 2) A function can have a local minimum at a point where the derivative does not exist

F 3) The function $y = x^3$ has a local maximum

F 4) A function that is concave up at a point is increasing

T 5) A function can be concave down over the entire real line

F 6) A boundary point of the domain is a critical value for a function

T 7) A stationary value is where $f'(x) = 0$

F 8) The function $y = \ln x$ is concave up everywhere it is defined

T 9) The function $y = e^x$ is concave up everywhere it is defined

T 10) A function can have any number of local maxima

F 11) Between any two maxima there must be a minimum

T 12) The function $y = mx + b$ has concavity zero

F 13) If $f'(x)$ is increasing on an interval, $f(x)$ is concave up there

T 14) A point where $f(x)$ has no derivative is always a critical point

F 15) A critical point is the maximum value of a function

T 16) For related rate problems both variables are differentiated with respect to time

T 17) If $f(x)$ and $g(x)$ are both increasing at $x = c$, then so is $h(x) = f(x) + g(x)$

T 18) If $f(x)$ and $g(x)$ are both concave up at $x = c$, then so is $h(x) = f(x) + g(x)$

F 19) If $f(x)$ is increasing and $g(x)$ is decreasing at $x = c$, then $h(x) = f(x) + g(x)$ is increasing

F 20) If $f(x)$ is concave up and $g(x)$ is concave down at $x = c$, then $h(x) = f(x) + g(x)$ is concave up

F 21) If $f'(x) = g'(x)$ on the real line, then $f(x) = g(x)$

T 22) An inflection point is where the concavity changes sign

T 23) $f''(x) = 0$ is true at every inflection point

T 24) Inflection points happen at extrema of $f'(x)$

T 25) A constant function has no extrema