Analysis "Fake Final Exam" 2020

1. The derivative of an exponential growth curve such as $y = 5^x$ most closely resembles (obviously no Desmos just use your noggin)

a) another exponential growth curve   b) an exponential decay curve   c) a log curve

d) The reflection of an exponential growth curve over the x axis

e) The reflection of an exponential decay curve over the x axis.

2. Consider three functions f(x), g(x) and h(x) where $h(x) = g(\sqrt{f(x)})$

If f(1) = 9, f'(1) = -2, g'(3) = 4, g'(9)=5, g(1) = 10 calculate h'(1).

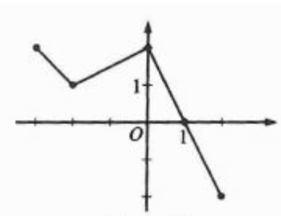
3. If g(x) is a second degree polynomial where g(0) = 5, g'(2)=3 and g''(15) = -6 write g(x) in standard form.

4. Find $\frac{d^{121}y}{dx^{121}}$ (the 121st derivative) if y = sin(2x)

a) $-2\sin(2x)$ b) $-2^{121}\cos(2x)$ c) $2^{121}\cos(2x)$ d) $2^{121}\sin(2x)$ e) $-2^{121}\sin(2x)$

5. Given the piecewise linear graph of $f(x)$ below, find $h'(1)$ *if* $h(x) = f(3x^2)$. Assume the function continues on infinitely in both directions.

a) 12   b) -12   c) 6   d) -6   e) -3



Graph of f

6. **Wind chill** (w in degrees Fahrenheit), is defined as the temperature a person feels when the velocity of the wind (v, in mph) is factored in. On a blustery 32 degree Fahrenheit day, the wind chill can be given by: $w(v) = 55.6 - 22.1v^{.16}$

a) Find the value of v at which the instantaneous rate of change of w is equal to the average rate of change of w over the interval v: [5, 60].

b) At time t = 0, the wind velocity is 20 mph. If the wind velocity increases at a constant rate of 5 mph per hour, what is the rate of change of the wind chill with respect to time ($\frac{dw}{dt}$) at t = 3 hours? Include units. Show work clearly.

7. Suppose that $g'(x) = \frac{3}{2\sqrt{x}} - (3x-2)^4 + 5\sin(9x)$ *and* $g(0) = 1$

Find g''(x) and also g(x).

a) g''(x) = ______________________________

b) g(x) = ________________________________

8. Knowing that $\lim_{x \to 2} \frac{x^3 - ax^2 + bx - 2}{x - 2} = -1$ solve for a, b. Show all work please.

9. Consider a function that satisfies the following: At x = 4, the value of the function is 1, and the slope of the function is 1.

a) Let $f(x) = ax^2$, where a is a nonzero constant. Show that it is not possible to find a value for a so that f meets the requirement above. [3]

b) Let $h(x) = \frac{x^n}{k}$ where k is a nonzero constant and n is a positive integer. Find the values of k and n so that h meets the requirement above. [5]

10. Find the equation of the line with positive slope that is tangent to both f(x) and g(x) below.

$f(x) = x^2$, and $g(x) = -x^2 - 1$