

Final Exam Math 1190 sec. 62

Spring 2017

Name: _____

Your signature (required) confirms that you agree to practice academic honesty.

Signature: _____

Problem	Points
1	
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INSTRUCTIONS: There are 10 problems worth 10 points each.

There are no notes, or books allowed and **no calculator is allowed. Illicit use of a calculator, smart phone, tablet, device that runs apps, or hand written notes will result in a grade of zero on this exam as well as a formal allegation of academic misconduct.** To receive full credit, answers must be clear, complete, justified, and written using proper notation.

(1) Evaluate each expression. No work needs to be shown; you either know them or you don't.

a) $\frac{d}{dx} \tan x =$

b) $\frac{d}{dx} \sin^{-1} x =$

c) $\lim_{x \rightarrow \infty} e^x =$

d) $\lim_{x \rightarrow 0^+} \ln x =$

e) $\frac{d}{dx} e^{-x} =$

f) $\lim_{x \rightarrow -\infty} e^x =$

g) $\frac{d}{dx} \cot x =$

h) $\frac{d}{dx} \tan^{-1} x =$

i) $\frac{d}{dx} \log_2 x =$

j) $\frac{d}{dx} 3^x =$

(2) Evaluate each limit using any applicable technique.

(a) $\lim_{t \rightarrow 3} \frac{e^{2t}}{t^2 + 1}$

(b) $\lim_{x \rightarrow 0} \frac{\sin x + x}{x}$

(c) $\lim_{x \rightarrow \infty} \frac{3x^2 + 4x + 1}{x^2 + 7}$

(3) Find the average value of $f(x) = \frac{1}{x}$ on the interval $[1, 4]$.

(4) Find the derivative of each function.

(a) $f(x) = 4x^3 - 2x^2 + 1$

(b) $g(x) = e^{2x} \cos(3x)$

(c) $y = \frac{e^t}{t + 1}$

(d) $f(x) = \ln(2x^2 + 3x)$

(e) $f(x) = \sec(x^2)$

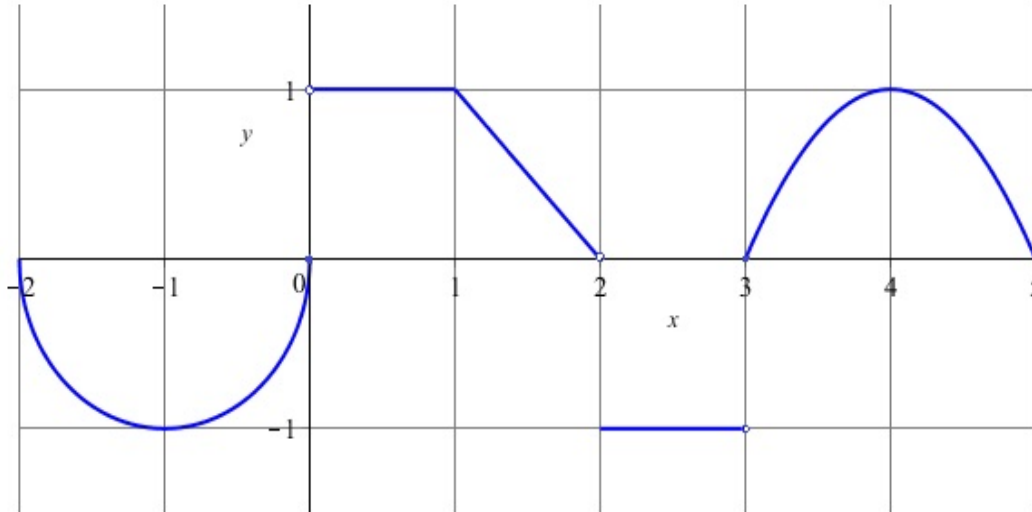
(5) Evaluate each definite integral.

(a) $\int_0^{\frac{\pi}{4}} \sec^2 \theta \, d\theta$

(b) $\int_{-2}^{-1} \frac{2x^2 + x}{x} \, dx$

(c) $\int_1^8 \frac{1}{\sqrt[3]{x^2}} \, dx$

(6) Use the graph of $y = f(x)$ shown to answer the following questions.



Evaluate, or state "DNE". (Explanations are **not** required.)

(a) $\lim_{x \rightarrow 0^-} f(x) =$

(b) $\lim_{x \rightarrow 2^+} f(x) =$

(c) $f'(1) =$

(d) $\lim_{h \rightarrow 0} \frac{f(4+h) - f(4)}{h} =$

(e) $\lim_{x \rightarrow 1} f(x) =$

(f) $\lim_{x \rightarrow 3} f(x) =$

(g) Is $f''(x)$ positive, negative, or zero on the interval $-2 < x < 0$?

(h) Is $f'(x)$ positive, negative, or zero on the interval $0 < x < 1$?

(i) Jack and Diane each evaluate the integral $\int_3^5 f(x) dx$. Jack arrives at the value $-\frac{4}{3}$ and Diane comes up with $\frac{4}{3}$. One of them is correct; who is and how do you know?

(j) What are the absolute maximum and absolute minimum values of f on the interval $-2 \leq x \leq 5$?

(7) The kinetic energy of a moving object of mass m and velocity v is $K = \frac{1}{2}mv^2$. Mass is in kilograms, velocity in meters per second, and energy in Joules (1 Joule = 1 kg m²/sec².)

(a) Express $\frac{dK}{dt}$ in terms of $\frac{dv}{dt}$ assuming the mass is constant.

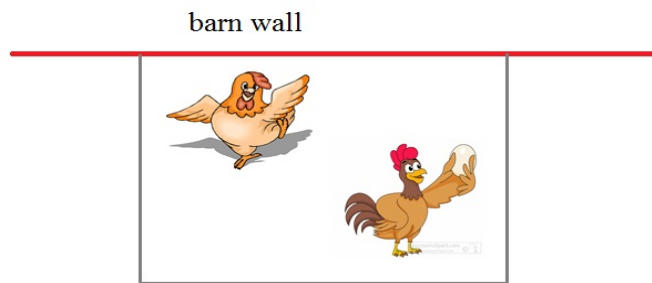
(b) Suppose a 10 kg mass is falling so that the rate of change of velocity is 9.8 meters/sec². Determine the rate of change of kinetic energy when the velocity is 1 meter/sec. (You do not have to include units in your answer.)

(8) Let $g(x) = \int_4^{x^2} e^{-t^2} dt$.

a. Evaluate $g(2)$

b. Evaluate $g'(x)$

(9) A farmer wants to enclose a rectangular chicken run next to her barn. She has 36 ft of fencing to use, and the barn will provide one side that won't require any fence. What are the dimensions of the run enclosing the largest possible area?



(10) Consider the relation $x^3y^2 + 2y = 8$.

(a) Find $\frac{dy}{dx}$.

(b) Find the equation of the line tangent to the graph of the relation at the point $(1, 2)$.