Math 34A Winter 2020
Old Final Exam #3

No calculators

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Excellence Bonus ____ / 1

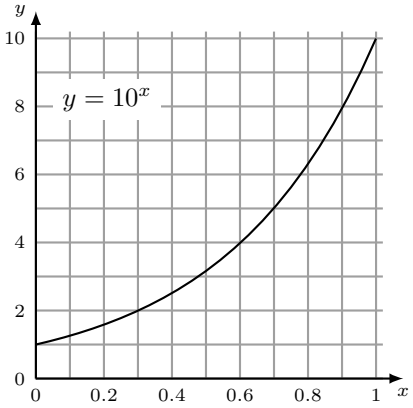
Score ____ / 66

Put answers in the boxes provided on this page. **Show high quality work** in your blue book for **all answers**. Points may be awarded for this. **Number your solutions** in the blue book.

At the end of the exam, place this page INSIDE your blue book.

TA: ☐ Garo ☐ Sam ☐ Trevor **Section Time:** ☐ 8am ☐ 6pm ☐ 5pm ☐ 7pm

1. [/6] Use the graph given to find the following as decimal numbers.



(a) Solve $\log(2x) = 2.7$

(b) Find 2.5^{10}

(c) What is the slope of the tangent at $x = 0.3$?

2. [/6] Let $f(x) = 4x^5 - 7x$ and $g(x) = x^3$. Find

(a) $\frac{d}{dx}\left(f(x) + 4g(x)\right)$

(b) $f''(x)$

(c) $f''(1) - 2g'(1)$

3. [/6] In this question k is a constant. Calculate

(a) $\frac{d}{dx}\left(e^{kx} + x^{3k}\right)$

(b) $\frac{d}{dx}\left(4/\sqrt{x}\right)$

(c) $\frac{d}{dx}\left((x^2+3)(x^3+5)\right)$

4. [/6] Let $y = 3x^2 - 7x + 2$.

(a) What is the value of x at which the slope of the graph is 1? $x =$

(b) What value of x produces the minimum of this function? $x =$

(c) Write the equation $y = mx + b$ of the tangent line to the graph at $x = 2$. $y =$

5. [/8] Marie stands on a cliff above a river. She throws a ball into the air. After t seconds, the height of the ball **above the cliff** is $20t - 5t^2$ meters. The ball lands in the river after 5 seconds.

(a) What was the speed of the ball when it hit the river? m/sec

(b) How high above the river is the cliff? meters

(c) How high did the ball go **above the cliff**? meters

(d) How high did the ball go **above the river**? meters

6. [/6]

(a) If 4 liters of red paint are added to 9 liters of blue paint, what is the ***exact*** percentage of red in the mixture?

%

(b) How many liters of red paint should be added to 9 liters of blue paint to get a mixture that is 30% red?

liters

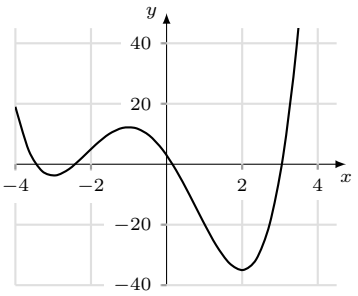
(c) How many liters of red paint should be added to 9 liters of blue paint to get a mixture that is x% red?

liters

7. [/6]

(a) For which value(s) of x is

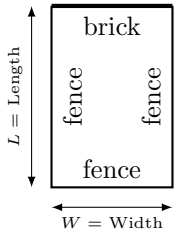
$$f'(x) = 0?$$



(b) For which values of x is $f''(x) < 0$?

(c) What is the slope of the graph at $x = 0$?

8. [/8] A rectangular field has fence along three sides and a brick wall along the other side. Fence costs \$2 per meter and brick costs \$5 per meter.



(a) Express the total cost of the fence and brick in terms of the length L and width W of the field.

(b) The area of the field will be 200 square meters. Express the ***length*** of the field in terms of the width of the field.

(c) Use this to express the total cost of brick and fence in terms of the width of the field.

(d) What should the width of the field be so that the cost is smallest?

[you can leave a square root in your answer]

9. [/6] Initially Jason is in Paris and Marie is in Rome. The road from Rome to Paris is 1000 km long. They both start driving at the same time. Jason drives at speed J for two hours then speeds up to speed $2J$. Marie drives at constant speed M. They meet after 3 hours. After 2 hours of driving they are 410 km apart.

Write two equations that express these facts.

equation

equation

What was ***Marie's*** speed?

km/hr

10. [/8] Ermila's Exotic Eatery sells Eggplant burgers. If the price of a burger is \$2, she sells 200. For each dollar she increases the price, she sells 10 fewer burgers

(a) If she sells burgers for $\$(2 + x)$, how many are sold?

(b) What is the total amount of money Ermila gets by selling burgers for $\$(2+x)$ each. ***Simplify your answer.***

(c) What price for the burger gives Ermila the most money?

(d) How many burgers does she sell to make the most money?