Math 34A Winter 2020
Old Final Exam #2

No calculators

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Excellence Bonus ____ / 1

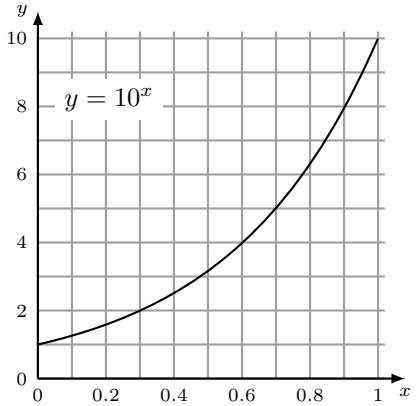
Score ____ / 68

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 $\log(y) = 3.62$

(b) Find $\log(2.75^{100})$

(c) What is the derivative of $f(x) = 10^x$ at $x = 0.4$?

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

(a) $\dfrac{df}{dx}$

(b) $f''(x)$

(c) $f''(0) + f'(1)$

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

(a) $\dfrac{d}{dx}\left(2e^{kx} + k^2\right)$

(b) $\dfrac{d}{dx}\big((3x + k)(3x - k)\big)$

(c) $\dfrac{d}{dx}\big((3x^2 + 5)/x^k\big)$

4. [/6] Let $y = x^2 - 8x + 3$.

(a) What is the value of x for which the slope of the graph is 1?

$x =$

(b) What is the minimum of this function?

$y =$

(c) Write the equation $y = mx + b$ of the tangent line to the graph at $x = 0$.

$y =$

5. [/8] Jason lay at the bottom mine shaft below ground level. He fired a flare vertically upwards. After t seconds the height of the flare above Jason was $35t - 5t^2$ meters.

(a) If the flare was 10 meters above ground level after 2 seconds, how deep is the mine?

meters

(b) What was the velocity of the flare after 1 second?

m/s

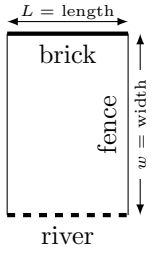
(c) What was the acceleration of the flare after 2 seconds?

m/s^2

(d) After how many seconds did the flare reach the greatest height?

seconds

6. [/8] A rectangular field has one side along a river. The opposite side is brick. The two remaining sides are fence. The length of the brick side is L meters. A meter of fence costs \$20 and a meter of brick costs \$5.



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

In parts (b), (c), and (d), the total cost is \$2,000.

(b) Express the length of the brick wall in terms of the width.

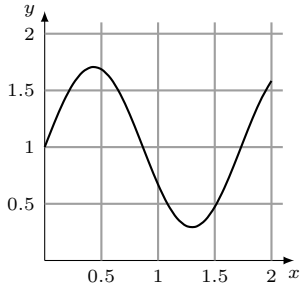
(c) Express the area of the field in terms of the width.

(d) What width gives a field with largest area?

7. [/6]

(a) For which value 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 $x = 1$?

8. [/6] Let $f(x) = 20\sqrt{x}$.

(a) Find $f'(4)$. [Simplify your answer to something like 7/3.]

(b) Find the tangent line approximation to $y = f(x)$ at $x = 4$.

(c) Use this to approximate the value of $20\sqrt{5}$.

9. [/8] Carol's chocolate cookies cost \$2 each and she sells 2200 at this price. For each cent she raises the price she sells 5 fewer cookies. The ingredients for 10 cookies cost \$2.

If Carol increases the price of a cookie by x cents:

(a) How many cookies will she sell?

(b) How many dollars profit does she make on each cookie?

(c) Express the total profit (in \$) in terms of x.

(d) What should x be to make the most profit?

(e) What should the price in \$ of one cookie be to make the most profit?

10. [/6] At 1pm Jason and Marie leave Zurich in the same car and drive to Paris. They drive at constant speed U for the first 2 hours and constant speed V for next 3 hours and then arrive in Paris. The length of the route they drive is 720 km. They drive 60 km more in the last 3 hours than in the first 2 hours.

Write two equations for U and V.

equation

equation

$U =$

How far are they from Paris at 2pm?