Math 34A Winter 2020
Old Midterm 3 #1

No calculators

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Excellence Bonus ____ / 1

Score ____ / 34

Put answers in the boxes provided. **Show high quality work** for **all answers**. Points may be awarded for this.

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

1. [/6] Use the graph given to find

(a) $\log(1000) + \log(0.34) =$ 2.54

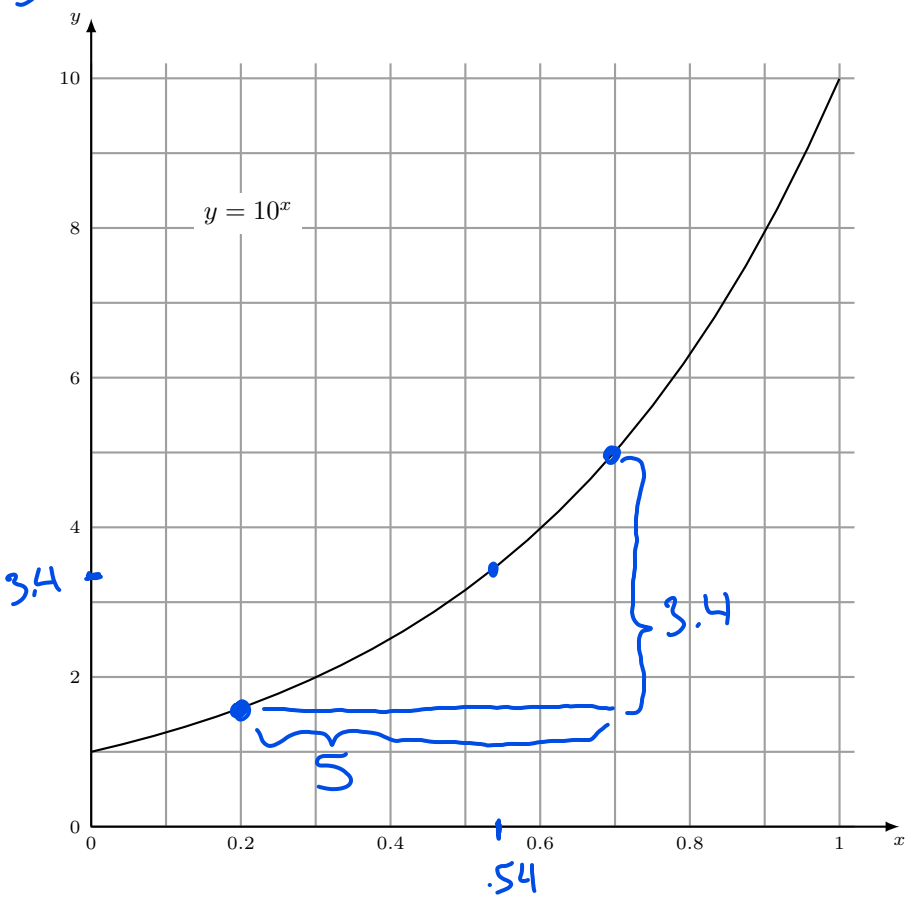
2 + .54 = 2.54

$= \log(100) + \log(3.4)$

(b) Solve $\log(y) = 1.87$. Then $y =$ $10^{1.87}$

(c) The average rate of change of 10^x between $x = 0.2$ and $x = 0.7$ is .68

$\frac{\text{rise}}{\text{run}} = \frac{3.4}{5} = .68$



2. [/6] Find the following derivatives. Simplify your answers.

(a) $\frac{d}{dx}\left(2e^{7x}+5x^3-7\right) =$ $14e^{7x}+15x^2$

(b) $\frac{d^2}{dx^2}\left(3x^4+12\sqrt{x}\right) =$ $36x^2-3x^{-3/2}$

(c) If $f(x)=cx^2+16/x$, then $f'(2) =$ $4c-4$

$f'(x)=2cx-16x^{-2}$

$f'(2)=4c-4$

3. [/4] The height of a tree is increasing at a constant rate. t years after 1950 the height is $h(t)$ feet, where $h(5)=40$ and $h'(5)=2$.

(a) How tall was the tree in 1975? $h'(t)$ is always 2

$h(t)=2t+b$ $b=30$

$h(t)=2t+30$ $h(25)=50+30=80$

The tree was 80 feet tall

(b) What year (ex: 1982) did the tree reach a height of 200 feet?

$2t+30=200$

$2t=170$

$t=85$

85 years after 1950 is 2035

The tree was 200 feet tall in 2035.

4. [/8] This question is about the function $f(x) = 2x^3 - 3x^2 - 12x + 5$

$f'(x) = 6x^2 - 6x - 12$

(a) What is the slope of the graph $y = f(x)$ at $x = 1$?

$f'(1) = 6 - 6 - 12 = -12$

slope = -12

(b) What is the equation of the tangent line to the graph at $x = 0$? (Please give answer in the form $y = mx + b$.)

$f(0) = 5$

$f'(0) = -12$ $\quad y = -12x + 5$

$y = -12x + 5$

(c) For which x value(s) is the graph $y = f(x)$ concave up?

$f''(x) = 12x - 6$

$12x - 6 > 0$

$12x > 6$

$x > \frac{1}{2}$

x = when $x > \frac{1}{2}$

(d) For what value(s) of x does the graph have slope 0?

$f'(x) = 6x^2 - 6x - 12 = 6(x^2 - x - 2) = 0$

$x^2 - x - 2 = (x - 2)(x + 1) = 0$

$x - 2 = 0$

or

$x + 1 = 0$

x = 2 or -1

5. [/10] The height of a rocket above the ground after t seconds is $-3t^2 + 30t$ meters.

(a) What was the velocity of the rocket after t seconds?

velocity = $-6t + 30$ m/s

$(t = 0)$

(b) What was the initial speed of the rocket?

initial speed = 30 m/s

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

-6 constant acceleration

acceleration = -6 m/s^2

(d) When was the velocity zero?

$-6t + 30 = 0$

$6t = 30$

$t = 5$

At t = 5 seconds

(e) How high above the ground was the rocket when the velocity was zero?

$30(5) - 3(5)^2$

$= 150 - 75 = 75$

height = 75 meters