

No calculators

PRINT NAME

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PERM NUMBER

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

TA: ☐ Garo

☐ Sam

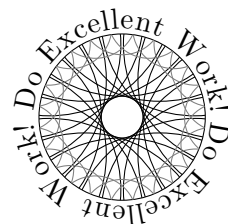
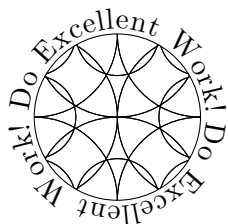
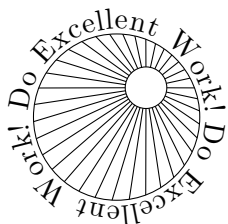
☐ Trevor

Section Time: ☐ 8am

☐ 6pm

☐ 5pm

☐ 7pm



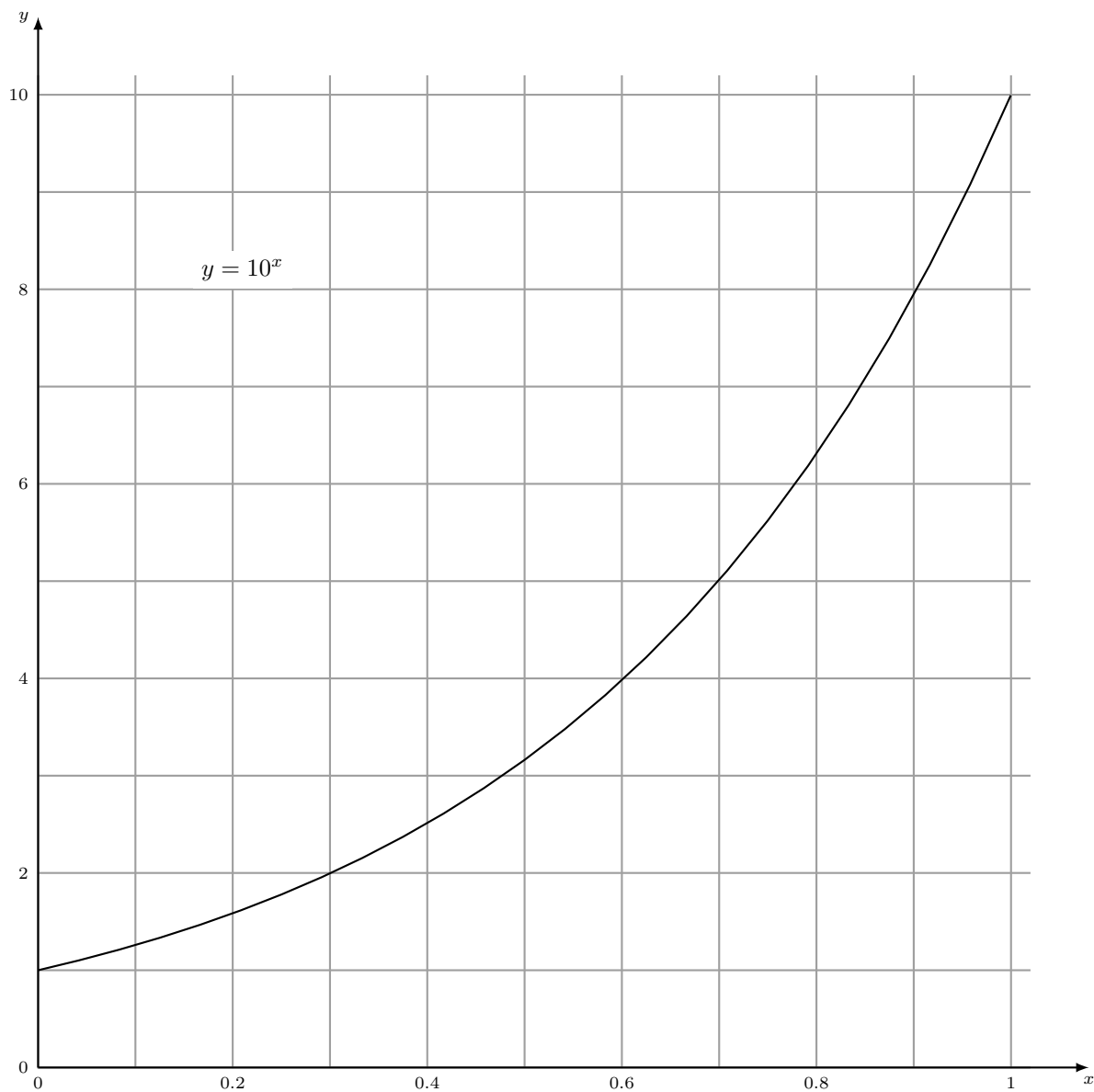
1. [/6] Use the graph given to find the following as decimal numbers.

(a) If $\log(2x) = 33$, then $x =$

(b) Find $5.5^{100} =$

(c) Find a value of c so that the average rate of change between $x = 0$ and $x = c$ is 6.

$c =$



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

(a) $\frac{df}{dx} =$

(b) $f''(x) =$

(c) $2f''(1) - f'(0) =$

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

(a) $\frac{d}{dx}(4e^{3kx} - 2x^k) =$

(b) $\frac{d}{dx}((3x + k)^2) =$

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

4. [/6] Let $y = 2x^2 - 9x + 5$.

(a) What is the value of x for 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 $x = 1$.

$y =$

5. [/8] Peter has built a small tower on top of Buchanan Hall. He stands on top of the tower and throws a ball into the air. After t seconds the height of ball above the tower in meters is $30t - 5t^2$.

The ball lands on the ground after 8 seconds.

- (a) How high is the tower above the ground?

meters

- (b) What was the speed of the ball after 5 seconds?

m/s

- (c) How high did the ball go **above the tower**?

meters

- (d) When was the ball going down at a speed of 5 m/s?

At $t =$

seconds

6. [/8] A tank initially contains 10 liters of blue paint. Then red paint enters the tank at a rate of 3 liters/hour while blue paint enters the tank at a rate of 2 liters/hour.

(a) How many liters of *red* paint are in the tank after t hours?

liters

(b) How many *total* liters of paint are in the tank after t hours?

liters

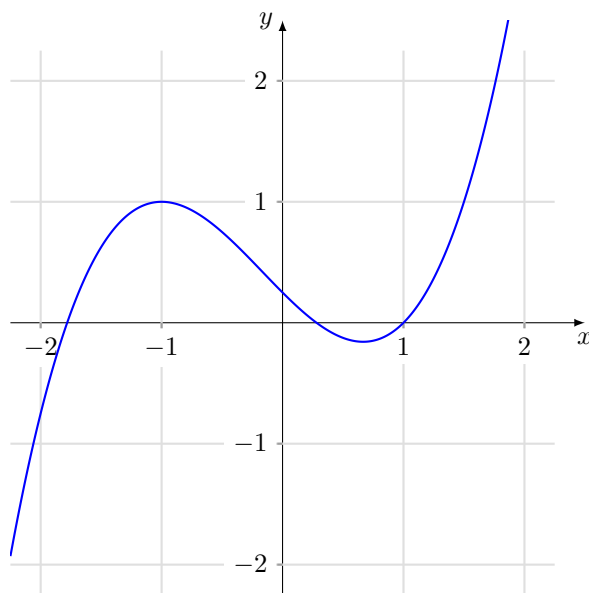
(c) What is the percentage of red paint in the tank after t hours?

%

(d) How many hours until 25% of the paint in the tank is red?

hours

7. [/6] Here is the graph of $y = f(x)$:



(a) For what value(s) of x is $f'(x) = 1$?

$x =$

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

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

slope =

8. [/6] Let $f(x) = x - e^{-x}$.

(a) Find $f'(0)$.

$f'(0) =$

(b) Find the tangent line approximation to $y = f(x)$ at $x = 0$.

$f(x) \approx$

(c) Use this to find an approximate value of $f(-0.2)$.

$f(-0.2) \approx$

9. [/6] Initially Jason is in Bakersfield and Marie is in Sacramento. The road from between them is 480 km long. They both start driving at the same time. Jason drives at speed $2J$ for the first hour, then stops for an hour. After this hour of rest, he drives at speed J . Marie drives at constant speed M . They meet after 3 hours. After 1 hour of driving, they are 260 km apart.

(a) Write two equations that express these facts.

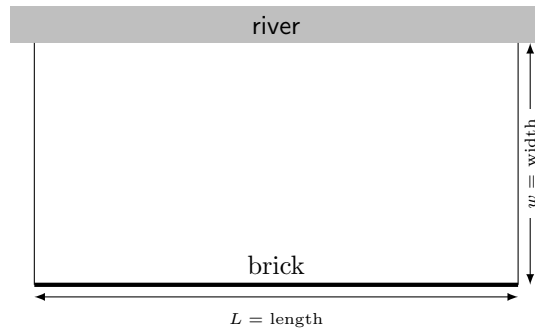
Equation #1:

Equation #2:

(b) What was *Marie's* speed?

km/hr

10. [/8] A rectangular field lies along a river. It has a brick wall along the side opposite the river, with stone walls along the two sides running perpendicular to the river. Stone walls costs \$180 per meter and brick costs \$40 per meter



- (a) Express the total cost of the (stone and brick) walls in terms of the length L and width w of the field.

cost =

- (b) The area of the field will be 100 m^2 . Express the **total length of brick wall needed** in terms of the width w of the field.

amount of brick wall =

meters

- (c) Use this to express the total cost of the (stone and brick) walls in terms of the width w .

cost =

- (d) What should the width of the field be so the cost is smallest? (You can leave a fraction or square root in your answer.)

width =

meters

11. [/6] Chris is organizing luxury bus tickets to Coachella from Isla Vista. If the ticket price is \$200, then Chris can sell 80 tickets. For each ***five dollars*** Chris increases the price, one fewer ticket is sold.

(a) If tickets are sold for $\$(200 + 5x)$ each (that is, if Chris raises the price by \$5 x times), how many are sold?

tickets

(b) Express the total amount of money Chris gets by selling tickets for $\$(200 + 5x)$ each. ***Simplify your answer.***

amount =

(c) What ***price should the ticket*** be for Chris to get the most money?

price =

