

**Mathematics 122 Test #3**

Name: \_\_\_\_\_

**You are to use your own calculator, no sharing.****Show your work to get credit.** This means that if you use your calculator to solve a problem, then you have to write a sentence telling how you used it to do the calculations. (That is if you graphed it and zoomed in then say that is what you did etc.)

(1) (50 Points) Compute the derivatives of the following functions (no simplification required):

(a)  $y = 5x^4 + 6x^3 - 9x^2 + 7x - 14$

$$y' =$$

(b)  $Q(r) = \frac{3}{r} - \frac{4}{\sqrt{r}}$

$$Q'(r) =$$

(c)  $w = \ln(z)$

$$w' =$$

(d)  $p(t) = 5^t$

$$p'(t) =$$

(e)  $A(u) = 4e^{3u^2+7u}$

$$A'(u) =$$

(f)  $f(x) = \ln(4x^3 + 3x^2)$

$$f'(x) =$$

(g)  $u(s) = s^2 e^{3s}$

$$u'(s) =$$

(h)  $P(t) = t^2 e^{3t} \ln(t)$

$$P'(t) =$$

(i)  $Q(s) = \frac{s^3 + 2s}{3s^4 - 4s}$

$$Q'(s) =$$

(j)  $C(t) = 3\sqrt{\frac{e^t + t}{t^3 + 1}}$

$$C'(t) =$$

(2) (10 Points) Find the area between the curves  $y = x^2$  and  $y = 6 - x$ .

Area = \_\_\_\_\_

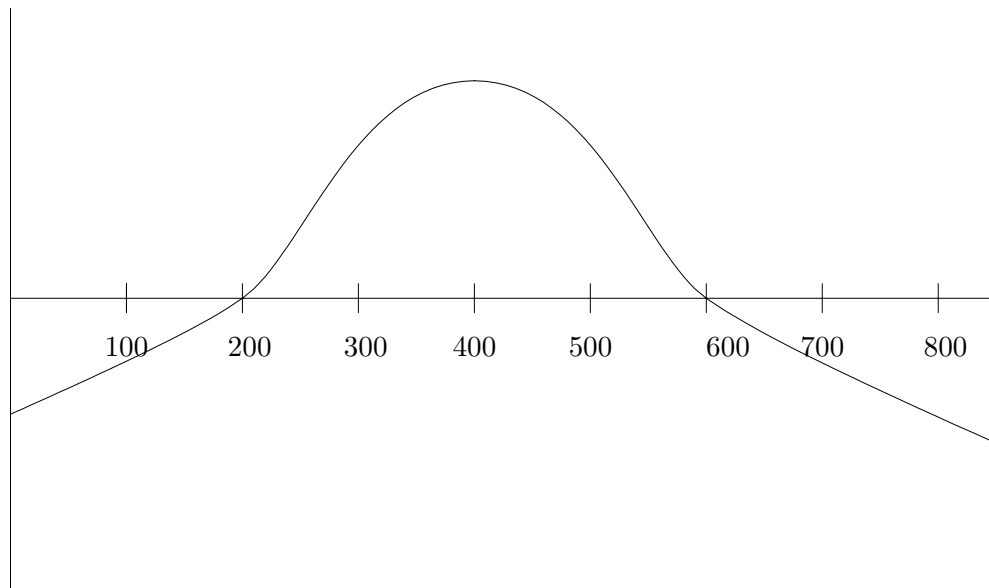
(3) (10 Points) What is the tangent line to  $y = 4\sqrt{4x + 1}$  at the point where  $x = 6$ ?

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(4) (10 Points) The marginal cost of producing a text book is  $MC(q) = \frac{2q + 11}{q + 5}$  dollars/book where  $q$  is the number produced. If the startup costs for producing the books are \$2,000.00 dollars, then what is the cost of producing 1,500 books?

\_\_\_\_\_

- (5) (15 Points) Below is the graph of the marginal profit of producing text books as a function of the number produced.



(a) What is the number of texts that maximize the profit?

(b) What is the number of texts that minimize the profit?

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(6) (5 points) What is the fundamental theorem of calculus?

(7) (5 points) Let  $f(x)$  be a function with  $f'(x) < 0$  for  $x < 3$  and  $f'(x) > 0$  for  $x > 3$ . Is  $x = 3$  a maximizer or minimizer of  $f$ ? Briefly explain your answer.