

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

Signature: \_\_\_\_\_

(By signing here you acknowledge that all of the work on this test is your own.)

Seat#: \_\_\_\_\_

Instructions:

- Except for the multiple choice questions where the answer must be circled, you must show appropriate legible work to receive full credit. DO NOT just put an answer.
- There are 100 possible points. Point values for each problem are as indicated.
- Check and make sure there are eight pages including the cover page, when you begin the exam.
- You can use one of the following calculators: TI-83, TI-83Plus, TI-84, or TI-84Plus. You are NOT allowed to use a calculator (like TI-89) that gives you unfair advantage over your classmates!
- SCHOLASTIC DISHONESTY WILL NOT BE TOLERATED.

**Good Luck!**

Question:	Points	Points Awarded
#1-#12	60	
#13	10	
#14	10	
#15	10	
#16	10	
<b>Total:</b>	100	

1. (5 points) The average rate of change of  $f(x) = 2x^2$  between  $x = 1$  and  $x = 3$  is :
- (a) 0.125
  - (b) 2
  - (c) 8
  - (d) 16
  - (e) none of the above
2. (5 points) If  $A(t) = A_0(1.07)^t = A_0e^{kt}$  then  $k$  (approximated to 4 decimal places) is :
- (a)  $k = 0.0294$
  - (b)  $k = 0.0677$
  - (c)  $k = 0.3936$
  - (d)  $k = 1.0725$
  - (e)  $k = 2.5404$
3. (5 points)  $\log_8\left(\frac{1}{2}\right)$  is:
- (a)  $-3$
  - (b) 3
  - (c)  $-\frac{1}{3}$
  - (d)  $\frac{1}{3}$
  - (e) none of the above.
4. (5 points) The gravitational force,  $F$ , between two bodies is inversely proportional to the square of the distance,  $d$ , between them. Which of the following is a formula representing this function ?
- (a)  $F = \frac{k}{d}$
  - (b)  $F = \frac{k}{d^2}$
  - (c)  $F = kd^2$
  - (d)  $F = k \ln(d)$
  - (e)  $F = kd$

5. (5 points) If a bank pays 6% per year interest compounded continuously, how long does it take for the balance in the account to double?
- (a)  $\approx 6$  years
  - (b)  $\approx 8.6$  years
  - (c)  $\approx 10$  years
  - (d)  $\approx 11.6$  years
  - (e)  $\approx 12$  years.
6. (5 points) If  $f(x) = 2x + 3$  and  $g(x) = 5x^2$  then  $g(f(x)) =$
- (a)  $10x^2 + 3$
  - (b)  $20x^2 + 60x + 45$
  - (c)  $25x^2 + 15$
  - (d)  $10x^2 + 45$
  - (e)  $20x^2 + 30x + 45$
7. (5 points) The function  $f(x) = 4 \cos(\frac{1}{2}t)$  is :
- (a) periodic with amplitude  $\frac{1}{2}\pi$  and period 4
  - (b) periodic with amplitude 4 and period  $\frac{1}{2}\pi$
  - (c) periodic with amplitude 4 and period  $4\pi$
  - (d) periodic with amplitude 4 and period  $\frac{1}{2}\pi$
  - (e) periodic with amplitude  $4\pi$  and period  $\frac{1}{2}$
8. (5 points) One model for the world's population (in billions)  $t$  years after 1990 is  $P = \frac{40}{1+11e^{-0.08t}}$ . According to this model, what is the maximum sustainable population of the world.
- (a)  $\frac{40}{12}$  billion
  - (b) 40 billion
  - (c) 11 billion
  - (d) 20 billion
  - (e) none of the above.

9. (5 points) Which of the following is NOT a power function:

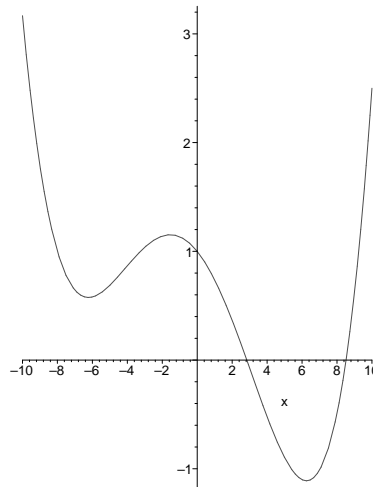
- (a)  $(3x^2)^3$
- (b)  $(\pi + 3)x^2$
- (c)  $\frac{3}{2\sqrt{x}}$
- (d)  $2^x$
- (e) all of the above are power functions.

10. (5 points) If the line  $l$  has a slope 5 and passes through the point  $(1, 3)$ , then it has a vertical intercept :

- (a)  $-14$
- (b)  $-3$
- (c)  $-2$
- (d)  $2$
- (e)  $3$

11. (5 points) Part of the graph of the polynomial  $p(x)$  is given below. What is the minimum possible degree of that polynomial ?

- (a) 3
- (b) 4
- (c) 5
- (d) 6
- (e) can not be determined.



12. (5 points) The monthly charge for a DSL service was \$36 in 2002 and \$29 in 2006. Assuming linear relationship between the DSL cost and year, how much will the monthly charge be for DSL service in 2010.

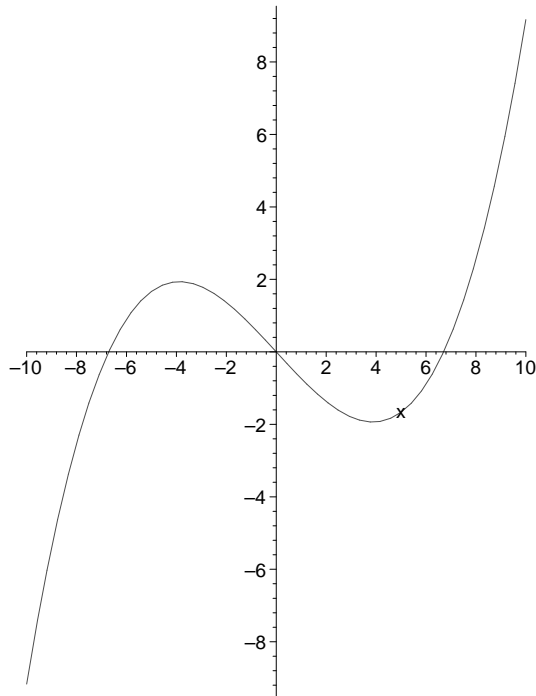
- (a) \$21
- (b) \$22
- (c) \$24
- (d) \$25
- (e) \$26

13. In the table below  $t$  is the number of years after 1995, and  $p$  is the amount of tobacco (in millions of pounds) produced that year.

t	1	2	3	4	5	6
p	1517	1787	1480	1293	1053	991

- (a) (3 points) Find the linear regression function (round to 2 decimal places)
- (b) (3 points) Find the exponential regression function (round to 2 decimal places)
- (c) (2 points) According to the linear regression function, approximately how many pounds of tobacco will be produced in 2005.
- (d) (2 points) According to the exponential regression function, approximately how many pounds of tobacco will be produced in 2005.

14. According to the graph below, list the  $x$ -intervals (rounded to the nearest integer) in which the function is:



- (a) (3 points) Increasing.
- (b) (3 points) Concave up.
- (c) (2 points) Concave down and increasing.
- (d) (2 points) What is  $f(f(-4))$  (approximated to the nearest integer)?

15. The island of Manhattan was sold for \$24 in 1626. Suppose the money had been invested in an account which compounded interest **continuously**.

(a) (*5 points*) How much money would be in the account in the year 2005 if the yearly interest rate was 5%?

(b) (*5 points*) If the yearly interest rate was 6%, in what year would the account be worth one million dollars?

16. (a) (5 points) Using the properties of the (natural) logarithm, fully simplify

$$\frac{\ln a + \ln b^2 - 2 \ln ab}{\ln a}.$$

(here  $a$  and  $b$  are positive numbers with  $a \neq 1$ )

- (b) (5 points) Solve the equation  $3^{2x-3} = 7$ .