Name: _____ **ID: A**

MA 181 Pretest

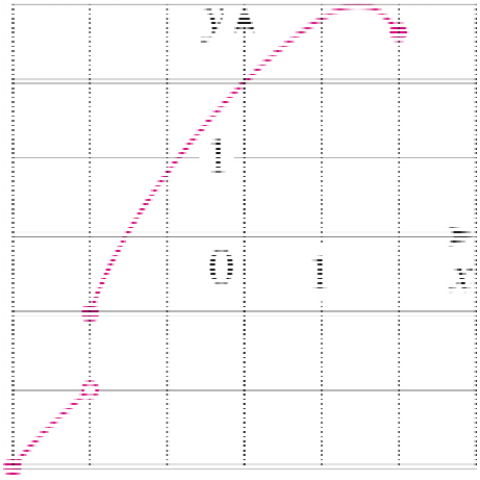
1. The graph of a function f is given.

   (a) State the value of $f(-2)$.

   (b) Estimate the value of $f(1)$.

   (c) Estimate the value of x such that $f(x) = 0$.

   (d) State the domain of f.



2. Let $f(x) = \sqrt{2x+5}$. Find

   (a) the domain of f.

   (b) the range of f.

3. Let $f(x) = \sqrt{2x+5}$. Find each of the following:

   (a) $f(0) + f(-2)$

   (b) $f(x+2)$

   (c) $[f(x)]^2$

   (d) $f(x^2)$

4. Express the area A of a circle as a function of its circumference C.

5. Find functions f and g such that $F(x) = 1 - 2\cos^2 x = \left(f \circ g\right)(x)$

6. Evaluate the difference quotient for the given function. Simplify your answer.

$f(x) = 4 + 3x - x^2, \quad \dfrac{f(x+h) - f(x)}{h}$

7. For the curve $f(x) = \sqrt{x+3}$, find the slope M_{PQ} of the secant line through the points $P = (1, f(1))$ and $Q = (6, f(6))$.

8. A weight is attached to a spring. Suppose the position (in meters) of the weight above the floor t seconds after it is released is given by $P(t) = 0.5 \sin\left(\pi t + \frac{\pi}{2}\right) + 1.2$. What is the average rate of change of the position of the weight (in m/s) over the time interval [3, 5]?

9. Each of the functions in the table below is increasing, but each increases in a different way. Select the graph from those given below which best fits each function:

t	1	2	3	4	5	6
f (t)	26	34	41	46	48	49
g (t)	16	24	32	40	48	56
h (t)	36	44	53	64	77	93

10. Solve the inequality: $x^2 > 9$

11. Solve the inequality: $\dfrac{x-1}{x^2-4} \geq 0$

12. Solve the equation $e^{2-3x} = 125$. Write your answer exactly [do NOT use decimal approximations].

13. Find the value of $\ln \sqrt{e^3}$.

14. The half-life of a certain radioactive substance is 5 days. The initial size of a sample is 10 grams.

    (a) Find the amount of the substance remaining after 20 days.

    (b) Find the amount of the substance remaining after *t* days.

    (c) Estimate, to the nearest 0.01 gram, the amount remaining after 14 days.

    (d) Estimate, to the nearest 0.1 day, the amount of time required for the mass of the substance to be reduced to 0.1 gram.

15. The following time-of-day and temperature (F°) were gathered during a gorgeous midsummer day in Fargo, North Dakota:

Time of Day	Temperature
18	74
17	73
16	73
15	72
14	70
13	70
12	68
11	66
10	63
9	62
8	59
7	58

Source: National Weather Service; www.weather.gov

    (a) Make a scatter plot of these data.

    (b) Fit a linear model to the data.

    (c) Fit an exponential model to the data.

    (d) Fit a quadratic model to the data.

    (e) Use your equations to make a table showing the predicted temperature for each model, rounded to the nearest degree.

    (f) The actual temperature at 8:00 p.m. (20 hours) was 70° F. Which model was closest? Which model was second-closest?

    (g) All of the models give values that are too high for each of the times after 6:00 PM. What is one possible explanation for this?

MA 181 Pretest
Answer Section

SHORT ANSWER

1. ANS:
   (a) -1 (b) ≈2.85 (c) -1.5 (d) $[-3, 2]$

   PTS: 1
2. ANS:
   (a) $[-\frac{2}{5}, \infty)$
   (b) $[0, \infty)$

   PTS: 1
3. ANS:
   (a) $f(0) + f(-2) = \sqrt{5} + \sqrt{1} = \sqrt{5} + 1$
   (b) $f(x + 2) = \sqrt{2(x + 2) + 5} = \sqrt{2x + 9}$
   (c) $[f(x)]^2 = 2x + 5, x \geq -\frac{5}{2}$
   (d) $f(x^2) = \sqrt{2x^2 + 5}$

   PTS: 1
4. ANS:
   $A = \frac{C^2}{4x}$

   PTS: 1
5. ANS:
   $f(x) = 1 - 2x^2$, $g(x) = \cos x$ is one possible answer. Answers will vary.

   PTS: 1
6. ANS:
   $3 - 2x - h$

   PTS: 1
7. ANS:
   $\frac{1}{3}$

   PTS: 1
8. ANS:
   0 m/s

   PTS: 1

9. ANS:
   $f(t)$: (B)
   $g(t)$: (A)
   $h(t)$: (C)

   PTS: 1
10. ANS:
    $(-\infty, -3) \cup (3, \infty)$

    PTS: 1
11. ANS:
    $(-2, 1] \cup (2, \infty)$

    PTS: 1
12. ANS:
    $x = \frac{2}{3} - \ln 5$

    PTS: 1
13. ANS:
    $\frac{3}{2}$

    PTS: 1
14. ANS:

    (a) The half-life is 5 days, so 20 days is 4 half-lives. After 20 days, $y = 10\left(\frac{1}{2}\right)^4 = \frac{10}{16} = 0.625\,g$.

    (b) The half-life is 5 days, so after t days, $y = 10e^{\left(\ln(1/2)/5\right)t}$

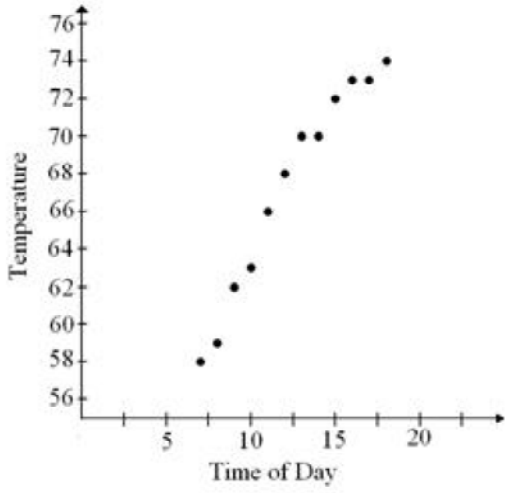
    (c) When $t = 14$, $y \approx 1.44$ g.

    (d) When $y = 0.1$ gram, $t = \dfrac{\ln \frac{0.1}{10}}{\ln \frac{1/2}{5}} \approx 33.2$ days.

    PTS: 1

15. ANS:

(a)



(b) $y = 1.561x + 47.68$

(c) $y = 49.89802\ e^{1.023831}$

(d) $y = -0.09263x^2 + 3.902611x + 33.934$

(e) Linear: 79
Exponential: 80
Quadratic: 75

(f) Closest: quadratic. Second-closest: linear

(g) Answers may vary, but only one explanation is that the data only reflect the part of the day when the air is warming and do not take into account cooling that takes place later in the day into evening. The only model that begins to reflect this is the quadratic model.

PTS: 1