MATH 117 PRACTICE PROBLEMS FOR TEST III

NOTE: ONLY AN INEXPENSIVE NON-GRAPHING CALCULATOR IS PERMITTED!

1. Solve for x by completing the square:

(a) $x^2 - 6x + 1 = 0$
(b) $4x^2 - 3x - 3 = 0$
(c) $5x - 1 = x^2$
(d) $(x - 1)(x - 2) = (x - 3)(x - 4)$
(e) $\frac{1}{1+x} = 8x$
(f) $\frac{t}{2t+1} = \frac{13}{1-3t}$

2. Find the axis of symmetry and the vertex of the parabola $y = -2x^2 + 16x - 1.$

3. Use the quadratic formula to find the roots of $f(x) = -x^2 + 3x + 1$.

4. *Without solving*, determine the *number of roots* that each of the following polynomials has. Show your work.

(a) $y = x^2 - 3x + 11$
(b) $y = x^2 - x - 1$
(c) $y = x^2 - 30x + 311$
(d) $y = x^3 - 4x^2 + 3x$
(e) $y = x^2 - 8x + 16$

5. If y = g(x) has domain [-17, 23] and range of [2, 7], find the *domain* and *range* of

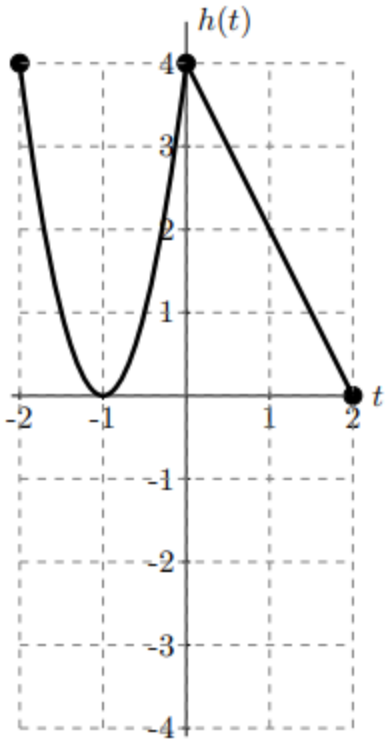
$y = 5 + 3\,g(4x - 9)$.

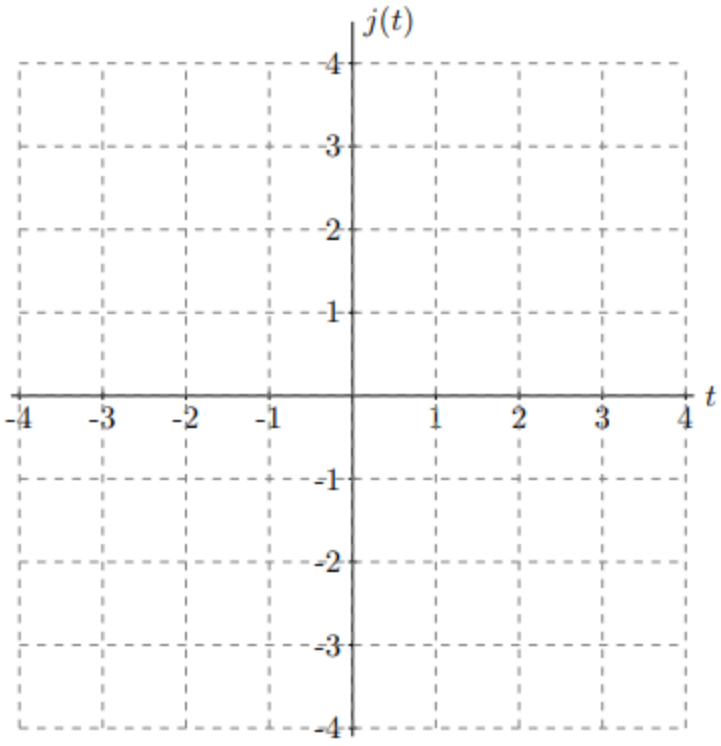
6. The temperature *T*, in degrees Fahrenheit, *t* hours after 8 AM is given by:

$$T(t) = -\tfrac{1}{2}t^2 + 10t + 40$$

What is the *warmest* temperature of the day? When does this happen?
Hint: Complete the square.

7. A graph of the function h(t) is given below. On the empty set of axes, carefully sketch a well-labeled graph of $j(t) = -\tfrac{1}{2}h(t + 2) - 1.$

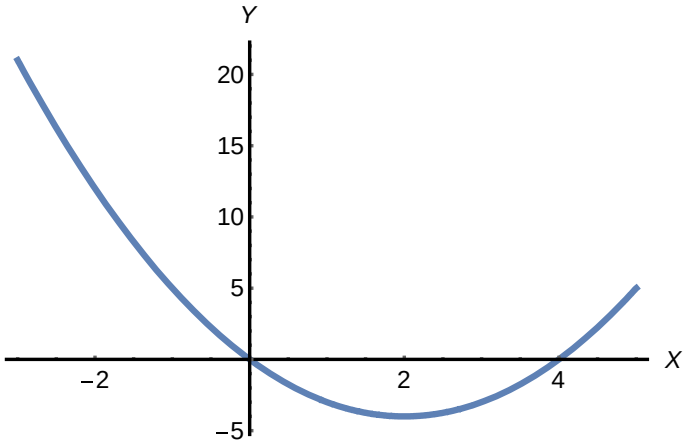




8. In the following, compute the **average rate of change** of the given function over the interval [1 – h , 2]. *Simplify* your answers

(a) f(x) = 1 – 3x
(b) g(x) = 1/x
(c) h(x) = x^2 +3x

9. A graph of the function h(t) is given below.



Sketch the graph of y = 3 – 5F(2x), *showing the progression of your work, one step at a time. On each graph, indicate the x-scale and the y-scale.*

10. A tomato is thrown vertically into the air at time $t=0$. Its height, $d(t)$ (in feet), above the ground at time t (in seconds) is given by

$$d(t)=-16t^2+48t$$

(a) Graph $d(t)$.
(b) Find t when $d(t)=0$. What is happening to the tomato the first time $d(t)=0$? The second time?
(c) When does the tomato reach its maximum height?
(d) What is the maximum height that the tomato reaches?

11. TRUE OR FALSE: Are the statements in Problems (1)-(15) true or false? Explain your answer.

1. The parabola $y=ax^2+k$ has vertex $(0,-14)$ and passes through the point $(5,6)$. Find its equation.

2. The quadratic function $f(x)=x(x+2)$ is in factored form.

3. If $f(x) = (x+1)(x+2)$, then the zeros of f are 1 and 2.

4. A quadratic function whose graph is concave up has a maximum.

5. All quadratic equations have the form $f(x)=ax^2$.

6. If the height above the ground of an object at time t is given by $s(t)=at^2+bt+c$, then $s(0)$ tells us when the object hits the ground.

7. To find the zeros of $f(x)=ax2+bx+c$, solve the equation $ax2+bx+c=0$ for x.

8. Every quadratic equation has two real solutions.

9. There is only one quadratic function with zeros at $x=-2$ and $x=2$.

10. A quadratic function has exactly two zeros.

11. The graph of every quadratic function is a parabola.

12. The maximum or minimum point of a parabola is called its vertex.

13. If a parabola is concave up its vertex is a maximum point.

14. If the equation of a parabola is written as $y=a(x-h)^2+k$, then the vertex is located at the point $(-h, k)$.

15. If the equation of a parabola is written as $y=a(x-h)^2+k$, then the axis of symmetry is found at $x=h$.

16. If the equation of a parabola is $y=ax^2+bx+c$ and $a<0$, then the parabola opens downward.

12. When a yam is taken from a refrigerator at $0°C$ and put into an oven at $150°C$, the yam's temperature rises toward that of the oven.[1] Let $Y(t)$ be the temperature in °C of the yam t minutes after it is put in the oven. Let $D(t)=150-Y(t)$ be the temperature difference between the oven and the yam at time t. Figure 6.6 gives the graph of $D(t)$.

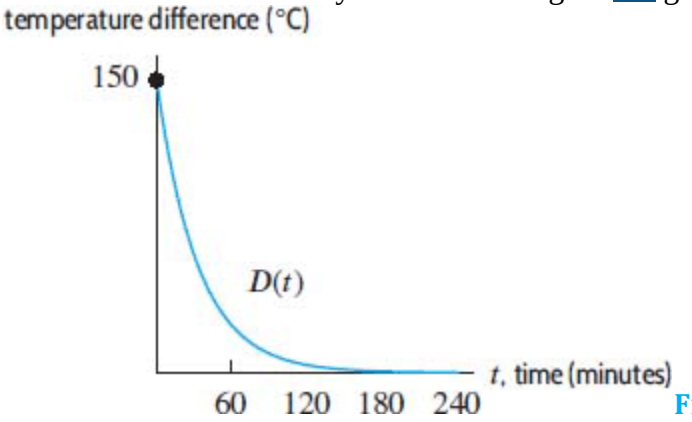


Figure 6.6

Temperature difference: Decreasing over time

(a) From the formula relating $Y(t)$ and $D(t)$, describe the transformations we apply to the graph of $D(t)$ to obtain the graph of $Y(t)$.

(b) Use the graph of $D(t)$ to sketch a graph of $Y(t)$.

(c) Explain the significance of the vertical intercept of D, then of Y.

(d) Explain the significance of the horizontal asymptote of D, then of Y.

13. Determine whether the following functions are even, odd, or neither.

(a) $f(x)=|x|$
(b) $g(x)=1/x$
(c) $h(x)=-x^3-3x^2+2$

14. The graph of $P = g(t)$ contains the point $(-1,-5)$.
(a) If the graph has even symmetry, which other point must lie on the graph?
(b) What point must lie on the graph of $-g(t)$?

15. Let $f(x) = x^2$. Assume domain of [-1, 2]. Sketch each of the following graphs. Also find domain and range.
(a) $y = -3f(x)$ (b) $y = f(-x)$ (c) $y = f(3x)$ (d) $y = 3f(x - 1)$ (e) $y = 4f(2x +$