Advanced Algebra II (H)
Chap 3: Quadratics
**Practice "Test"** (30 min)

Date Key

1. Write a rule for g and then identify the vertex. $f(x) = x^2$. It undergoes a vertical stretch by a factor of 3, then a reflection in the x-axis, followed by a translation 3 units down.

$g(x) = -3x^2 - 3$

2. Describe the transformation of the graph of the parent quadratic function.

$f(x) = \frac{1}{3}(x-2)^2 + 1$

① horizontal translation 2 units right,
② vertical shrink by factor of $\frac{1}{3}$
③ vertical translation 1 unit up

3. Write the quadratic function in standard form that has vertex $(-1, -2)$ and passes through point $(-4, 7)$

① $y = a(x-h)^2 + k$
② $7 = a(-4+1)^2 - 2$
③ $9 = a(-3)^2$
④ $a = 1$
⑤ $y = (x+1)^2 - 2$
$y = x^2 + 2x + 1 - 2$
$\boxed{y = x^2 + 2x - 1}$

4. Graph the function. Label 5 critical points and the axis of symmetry.

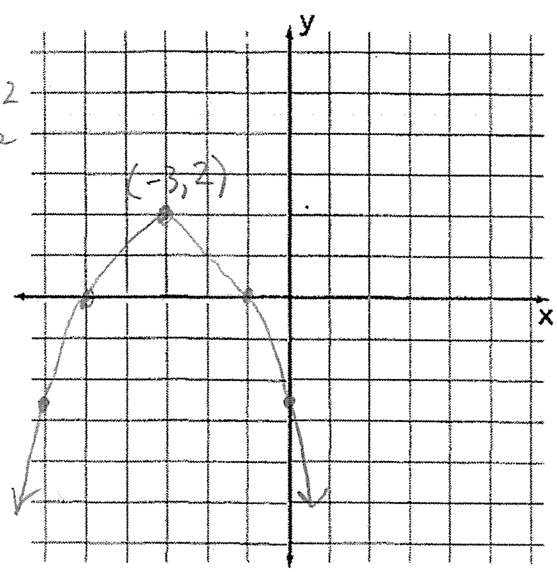
$g(x) = -\frac{1}{2}(x+3)^2 + 2$

vertex $(-3, 2)$

y-int: $(0, -2.5)$
$y = -\frac{1}{2}(9) + 2$
$= -4.5 + 2$
$= -2.5$

sym pt $(-6, -2.5)$

x-int:
$0 = -\frac{1}{2}(x+3)^2 + 2$
$-2 = -\frac{1}{2}(x+3)^2$
$4 = (x+3)^2$
$\pm 2 = x + 3$
$\pm 2 - 3 = x$
$x = -1$
$x = -5$

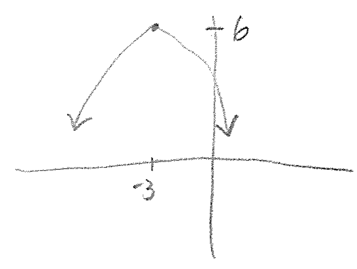



5. State the intervals in which the function is increasing and decreasing.

$y = -\frac{1}{3}x^2 - 2x + 3$

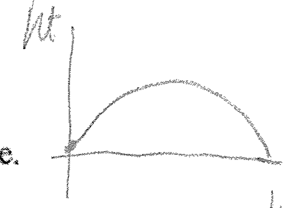
vertex $x = \frac{2}{2(-\frac{1}{3})}$
$= \frac{2}{1} \cdot -\frac{3}{2} = -3$

$y = -\frac{1}{3}(9) + 6 + 3$
$= -3 + 6 + 3$
$= 6$
$(-3, 6)$




Increasing interval: $(-\infty, -3)$ decreasing interval $(-3, \infty)$

6. The height of a bridge is given by $y = -3x^2 + x$, where $y$ is the height of the bridge (in miles) and $x$ is the number of miles from the base of the bridge.




distance from base

a. How far from the base of the bridge does the maximum height occur?

Occurs at $\frac{1}{6}$ of a mile.

vertex

b. What is the maximum height of the bridge?

$\frac{1}{12}$ of a mile

a) $x = \frac{-1}{2(-3)} = \frac{1}{6}$

$y = -3\left(\frac{1}{36}\right) + \frac{1}{6}$

$-\frac{1}{12} + \frac{2}{12} = \frac{1}{12}$

7. Write the equation of the parabola in intercept form.

$x$-intercepts of $-7$ and $-1$; passes through $(1, 1)$

$y = \frac{1}{16}(x+7)(x+1)$

$y = a(x-p)(x-q)$

$1 = a(1+7)(1+1)$

$1 = 16a$

$a = \frac{1}{16}$

$y = \frac{1}{16}(x+7)(x+1)$

8. Write the equation of the parabola in vertex form.

passes through $(4, -7)$ and has vertex $(1, -6)$

$y = -\frac{1}{9}(x-1)^2 - 6$

$y = a(x-h)^2 + k$

$-7 = a(4-1)^2 - 6$

$-1 = 9a$

$a = -\frac{1}{9}$

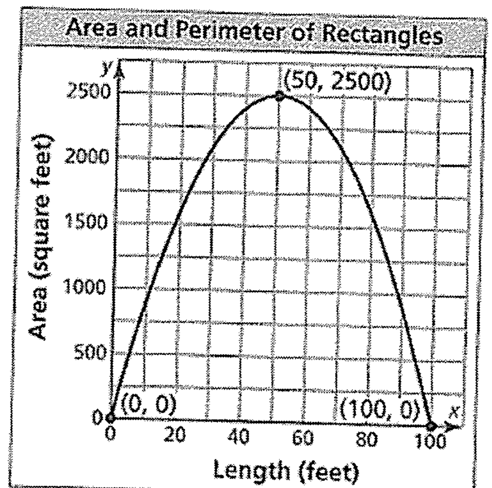
$y = -\frac{1}{9}(x-1)^2 - 6$

9. The graph shows the area $y$ (in square feet) of rectangles that have a perimeter of 200 feet and a length of $x$ feet.

a. Interpret the meaning of the vertex in this situation.

b. Write an equation for the parabola to predict the area of the rectangle when the length is 2 feet.

c. Compare the average rates of change in the area from 0 to 50 feet and 50 to 100 feet.




a) A rectangle with a length of 50 feet has the largest area which is 2500 sq. feet.

b) vertex (50, 2500) $x$-intercepts = 0 & 100

$y = a(x-p)(x-q)$

$2500 = a(50-0)(50-100)$

$-1 = a$

$y = -1(x-0)(x-100)$

$y = -x^2 + 100x$

$-4 + 200$

196 ft

c) $0 \le x < 50$

$avg = \frac{2500}{50} = 50 \frac{\text{sq ft}}{\text{feet}}$

$50 < x \le 100$

$avg = \frac{2500}{-50} = -50 \frac{\text{sq ft}}{\text{feet}}$

10. A basketball is thrown up in the air toward the hoop. The table shows the heights $y$ (in feet) of the basketball after $x$ seconds. Find the height of the basketball after 5 seconds. Round your answer to the nearest hundredth.

| Time, $x$ | 0 | 9 | 18 |
|---|---|---|---|
| Basketball height, $y$ | 6 | 10 | 6 |

$y = ax^2 + bx + c$

$6 = c$

$10 = 81a + 9b + c$

$6 = 324a + 18b + c$

$81a + 9b = 4$

$324a + 18b = 0$

$-162a - 18b = -8$

$162a = -8$

$a = \frac{-8}{162} = \frac{-4}{81}$

$10 = 81\left(\frac{-4}{81}\right) + 9b + 6$

$4 = -4 + 9b$

$8 = 9b$

$\frac{8}{9} = b$

$y = -\frac{4}{81}x^2 + \frac{8}{9}x + 6$

$f(5) = -\frac{4}{81}(25) + \frac{8}{9}(5) + 6$

$= 9.20987$

ht $\approx$ 9.21 feet