

Name _____ Section _____

Instructions: Work all 9 problems on the test paper. (Use the back side of the page if you need more room.) No books, notes, or collaboration with others.

(Do not write below this line)

1. _____ (10)
 2. _____ (10)
 3. _____ (12)
 4. _____ (10)
 5. _____ (10)
 6. _____ (12)
 7. _____ (10)
 8. _____ (10)
 9. _____ (16)
- Total _____ (100)

1. **(10 points)** A metric time proposal advocates dividing the day into 10 equal “hours.” In addition, the metric week is to begin at noon on Sunday, whereas the standard week begins 12 (standard) hours later, at midnight.

Let y and x be the numbers of hours, in metric hours for y and standard hours for x , of the time since the beginning of the metric and standard weeks, respectively.

(a) Write a formula giving y in terms of x .

(b) Similarly express x in terms of y .

2. (10 points) Kimmy the squirrel runs up the side of Carnegie building, slips and falls back down. She started at the 2nd floor window, 10 feet above the ground, and runs straight up at a rate of 1 foot per second. When she is 60 feet above the ground, she slips and falls back to the ground. As she falls, her height is given by:

$$h(t) = -16(t - 50)^2 + 60.$$

After she hits the ground (at $t = 50 + \frac{\sqrt{15}}{2}$ seconds) she lies motionless for 5 seconds before she scurries away.

- (a) Write a function $H(t)$ describing the height of Kimmy the squirrel during the period described in the problem, (i.e., up until Kimmy scurries away.)

- (b) What is the range and domain of the function in part (a)?

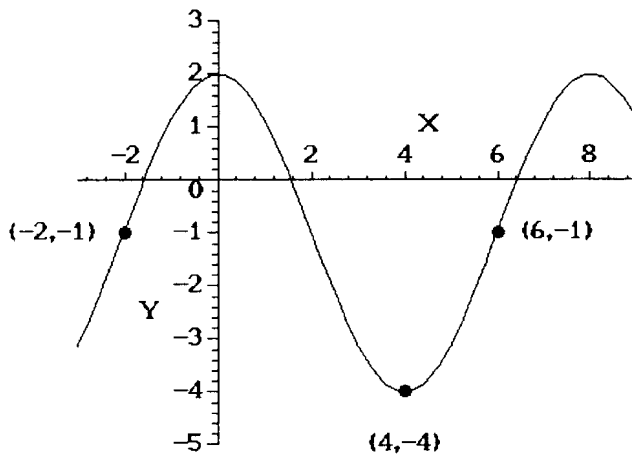
3. (12 points)

(a) Find a formula for the parabola whose vertex is $(5, -4)$ and which passes through the point $(8, 5)$.

(b) What are the zeros of the quadratic function found in (a)?

4. (10 points)

(a) Determine the amplitude, period and midline of the trigonometric function whose graph is shown below, and then write an equation of the form $Y=A \sin [B (X-k)] +h$ to represent it. (You may use cosine).



(b) Find the exact value of $\tan t$ when $\frac{\pi}{2} \leq t \leq \pi$ and $\sin t = \frac{3}{5}$

5. (10 points) Solve the following equations for t :

(a) $10^{3t+2} = 10^{11}$

(b) $200 e^{\frac{t}{4}} = 1000 e^{\frac{t}{8}}$

6. **(12 points)** The population of squirrels on the SU campus in 1990 was 18,000. Due to the growth in motor vehicle traffic on campus, the squirrel population has decreased by 4.2% per year.

(a) Express the squirrel population as a function of years since 1990.

(b) If animals are placed on the endangered species list when there are fewer than 500 of them left, in what year will the Syracuse University squirrel be placed on the endangered species list?

7. **(10 points)** An isosceles triangle has 2 sides of length 70 cm and a base 40 cm long.
Find:

(a) the angle between the base and 1 side (to the nearest degree);

(b) the area of the triangle to the nearest tenth of a square cm.

8. (10 points) Given $f(x) = x^2 + 1$ and $g(x) = x - 3$ find:

(a) $f(g(1))$

(b) $g(f(1))$

(c) For what values of x does $f(g(x)) = g(f(x))$?

9. (16 points) Given $f(x) = \frac{2x(x-3)}{(x-1)^2}$. Find

(a) x intercept (s)

(b) y intercept

(c) any vertical asymptotes

(d) any horizontal asymptotes

(e) sketch the graph