

MATH 099 - Sample final exam

This is a final exam that was given sometime in the 1990's. It's not a perfect fit for our course, but it's close.

Simplify each expression (#1 - 9) as much as possible.

1. $(25x^6)^{1/2}$
2. $(y+2)^2 - (y-2)^2$
3. $\frac{1}{x} - \frac{1}{x+2}$
4. $\sqrt{8u^3} \sqrt{2u}$
5. $\frac{b^{t+2}}{b^t}$
6. $10^{-1} - \frac{1}{10}$
7. $\log_2(4) + \log_2(1/4)$
8. $(\frac{1}{n} + 1) \div \frac{1}{n}$
9. If $P(x) = 3 + 3x$, then $P(1-t) = ?$

Find all solutions of each equation (#10 - 14).

10. $\sqrt{15-w} - 2\sqrt{w} = 0$
11. $x^2 - 20x + 10 = 0$
12. $1 + \frac{21}{t^2} = \frac{10}{t}$
13. $8 \cdot 25^t = 100$
14. $\frac{c}{c-5} = \frac{c-10}{c}$

Factor the following polynomials completely (#15 - 16).

15. $x^4 + 21x^2 - 100$
16. $k(k+10) + 10(k+10)$

Answer the following questions (#17 - 23) about graphs.

17. Find the the x-intercept, the y-intercept and the slope of $6x + 8y = 24$.
18. $y = x^2 - 20x$: What is shape, the vertex and the range?
19. Write the equation of the circle whose highest point is (0,10) and passes through the origin.
20. A rock climber starts at the point (-100,0) and crawls up the face of a steep cliff in a straight line toward the y-axis. In order to gain 10 feet in elevation, she must advance 2 feet horizontally. Write the equation of the climber's route, and determine how far she must crawl to reach the y-axis?
21. The graph of $y = x^2 - 170$ crosses the positive x-axis at P. Find the integer that is closest to P.
22. Line L passes through the origin and is perpendicular to $x + y = 8$. Find the coordinates of the point where $x + y = 8$ and L intersect.
23. Determine whether the following functions are INCREASING or DECREASING when $x > 0$.
 $r(x) = 1/x$ $f(x) = 5 - x$ $p(x) = x^2$ $g(x) = 2^x$ $s(x) = \sqrt{x}$ $d(x) = 2^{-x}$ $c(x) = \log_2(x)$
24. The BCC Science Division has \$1200 with which to buy equipment. Since unspent money must be returned to the general college fund, the division decides to spend the entire amount on computer memory cards -- one card for each of its 26 Macintosh computers. Hacker's Hardware, Inc. offers the best deal on A and B memory cards, which sell for \$40 and \$50, respectively. How many cards of each kind should the Science Division order?
25. Consumer experts advise us never to pay the sticker price (S dollars) for a car. A good rule of thumb is to pay $P = \frac{4S + 1000}{5}$ dollars. If you have \$10,000 to spend on a car, what is the most expensive sticker price you can afford? Express S in terms of P (i.e. solve for S).
26. A large swimming pool is full of water. At time $t = 0$ the pool springs a leak, and after t hours have gone by, the depth of the water in the pool is $D = 0.4t^2 - 4t + 10$ feet. How deep is the pool, and how long does it take for the pool to empty?

27. The bigger the house, the more it costs. The relationship between cost and living space is linear.

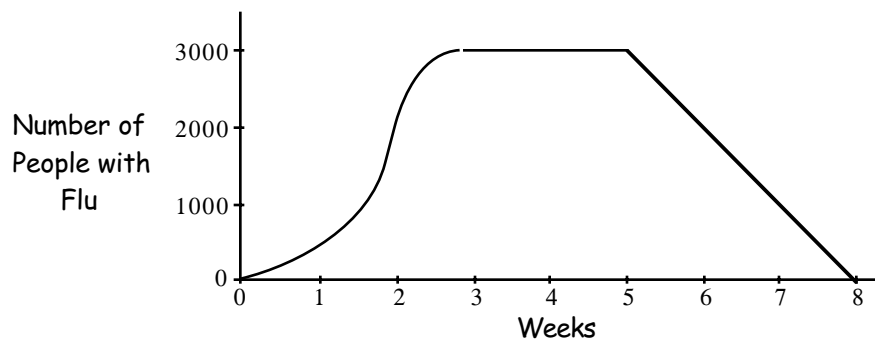
x (sq. ft.)	C (\$)
2000	200,000
2500	235,000
3000	270,000

Find a formula that fits the given data, and determine how much you should expect to pay for a 2700-square foot house. Then, briefly explain what SLOPE means in this context.

28. A photo copier is purchased for \$5000 on July 1, 1993. Then it depreciates. When it is t years-old, its value is $V = 5000(0.8)^t$ dollars. How much will the photo copier be worth on July 1, 2003, and how long after purchase should you keep it, if you want to sell it for \$1000?

29. Use your calculator to graph $p(x) = 5x \cdot 2^{-x}$ in the window $0 \leq x \leq 6$, $-2 \leq y \leq 4$. Sketch the graph and determine maximum value of $p(x)$ rounded-off to the nearest tenth.

30. The graph shows the number of people in King County with flu during a recent epidemic as a function of time.



- How many people had the flu on the tenth day?
- For how many weeks was the epidemic at its peak?
- When was the rate of infection greatest?
- When was a vaccine discovered?
- What was the average number of flu cases per day during this 8-week outbreak?