

Practice Final Exam

MTH U121

Page 1

Name

1. Algebra Review: Chapter 1 (pg 21: 29-70) (pg 42: 22-36, 51-60) (pg 55: 75-80)

a. Simplify the expression $\frac{(5x^3)^2 \cdot (11x^{12})}{(x^5)^4}$ and solve $\frac{(5x^3)^2 \cdot (11x^{12})}{(x^5)^4} = \frac{275}{121}$

b. Simplify the expression $\frac{\sqrt[5]{x^{25}y^{35}}}{\sqrt[3]{x^{12}y^{27}}}$ and evaluate at $x = 9$ and $y = 3$.

c. Simplify (hint: factor first) $\frac{x^2 + 3x - 4}{x^2 - 4x - 5} \cdot \frac{x^2 + 3x + 2}{x^2 + x - 2}$

d. Simplify the compound expression $\frac{\frac{y-x}{x} - \frac{x}{y}}{\frac{1}{x^2} - \frac{1}{y^2}}$

e. Solve for x : $\frac{5x}{5x+5} + \frac{2}{12x-2} = 1$

ANS. ai. $\frac{275}{x^2}$; aii. ± 11 ; bi. $\frac{x}{y^2}$; bii. 1; c. $\frac{x+4}{x-5}$; d. xy ; e. $\frac{2}{5}$

2. Linear functions, modeling, variation sec 1.10 and sec 1.11. (pg 127: 25-42 assorted word problems).

a. The Cost, C, of shipping a refrigerator varies directly with the the number of miles, M, that it is shipped. If the cost is \$40 to ship a refrigerator 300 miles what is the cost to just ship the refrigerator 90 miles?

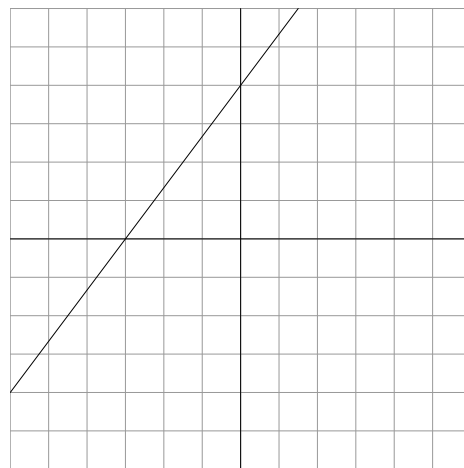
b. How far can a refrigerator be shipped for \$90?

answer: C= \$6; b: 675 miles

c. Here is the graph of a linear function. Find the equation of the function in the form

$y = mx + b$.

answer $y = \frac{4}{3}x + 4$



3. Transforms of graphs; Reading graphs; Average rate of change; sec 2.1-2.4, pg 157: 70-71)(pg 169: 83-87) (pg 179: 13-16,17-28,31-34)(pg 190: 11-16,19-20,53-54)

a. The sketches show the graph of a piecewise linear function.

i) What is $f(3) =$

ii) Find the average rate of change from $x = -2$ to $x = 5$.

Practice Final Exam

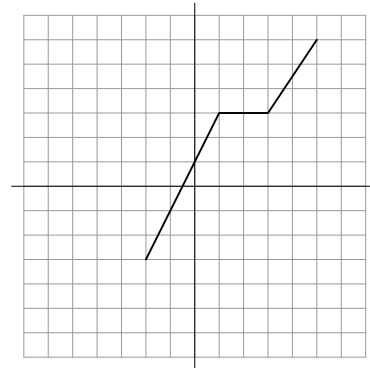
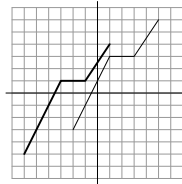
MTH U121

Page 2

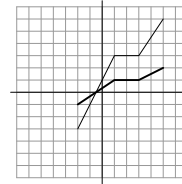
Name

b. Add to the sketch the graph of $y = f(x + 4) - 2$

Sketch:



ANS.



c. Add to the sketch the graph of $y = \frac{1}{3}f(x)$ ANS.

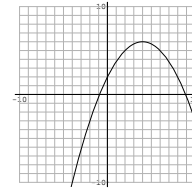
4. Quadratics: Find vertex, intercepts, extrema and sketch, sec 2.5. (pg 201: 5-37)

a. Sketch the graph of $y = 2 + 2x - \frac{1}{4}x^2$

What is the vertex? (give xy-coordinates)

c. What is the y-intercept?

d. What are x-intercepts if any (if none, state so).



ANSWERS: b) (4, 6); c) (0, 2); d) $4 \pm 2\sqrt{6} = -0.898979, 8.898979$

5 Word Problem: Quadratic Max/Min, sec 2.5 and sec 2.6 (pg 212: 27, 28) (pg 201: 60)

a. A student entrepreneurial group imports high-tech pens for six dollars apiece. Currently they sell 24 a day at a price of ten dollars apiece. What is their current profit?

b. A survey indicates that for every dollar they raise the price, they will sell 3 less pens a day. Write down a function that models the daily profit as a function of the price set.

c. What price maximizes the profit and what is the maximum profit.

d. The students decide they don't really need to maximize the profit. They only want to make a profit of \$60.00 a day. What price(s) should they set in order to make this profit?

ANS: a) \$96.00 per day ; b) $Profit = -324 + 72 \cdot price - price^2$; c) \$12, \$108

6 Chapter 3: Complex numbers and zeros of polynomials. sec 3.4 (pg 290: 25-46) (pg 290: 57-70), Sec 3.5 (pg 298: 1-8, 13-16. 25-28) pg 298: 31-40 (pg 33: 133) (pg 298:

a. Put the expression in the form $a + bi$ with a, b real numbers.

i. $(6 + 5i) \cdot (3 - 2i) =$ ii. $\frac{5 - 6i}{4 - 3i} =$ iii. $\frac{1}{i - 1} + \frac{1}{i + 1} =$

Practice Final Exam

MTH U121

Page 3

Name _____

- b. Find all solutions of the equation: $x^3 + \frac{1}{2}x^2 + x = 0$
- c. Find all solutions of the equation: $x^4 + x^2 - 12 = 0$.
- d. Find a polynomial with integer coefficients that has degree four and zeros 3 and $2 - 5i$ with 3 a zero of multiplicity 2.

7 Exponential Word Problem: (pg 340: 73-81; pg 367: 67-74) (pg 380: 8-10; 7, 1-3)

7a. A student invests \$5,000 in an account that pays 7.5% interest per year, compounded monthly. (i) How much will the investment be worth in five years? (ii.) How long must the student wait for the initial investment of \$5,000 to be worth \$8,000?

i) \$7,266.47; ii) 6.28629 years

7b. A student is researching the growth of genetically modified fruit flies for an 6 credit honors thesis course. From careful observation the student has determined that an initial batch of 1,000 fruit flies grows to 2,250 in eight weeks. Assuming that the growth rate follows the exponential law $A(t) = A_0e^{kt}$ answer the following (i) Find the value of the constant k . (ii) Starting from 1,000 fruit flies, how many will there be in 12 weeks? (iii) How many weeks does it take 1,000 fruit flies to grow to 5,000?

ANSWER: i) $k = 0.101366$; ii) $A(12) = 3,375$ flies; iii) $t = 15.88$ weeks

8 Angles (degrees, radians), Arclength and Trig. functions, and Solving triangles (Inverse Trig Functions), Sinusoidal graphs. (pg 476: 69-73; 49-51) (pg 558: 53-55; pg 485: 45-46,52-60); sec 5.3 (pg. 429: 28, 29, 30, 31, 34, 38) (pg 429: 41a, 43a, 45a, 47a)

a. Two research vessels are studying sea currents in the north Atlantic Ocean. At 12:45 PM on April 25 the first ship was at latitude 85 degrees, 15 minutes. The second ship was due south of it at latitude 65 degrees, 45 minutes. Using $r = 3960$ miles for the radius of the Earth determine the distance between the two ships along the surface of the Earth.

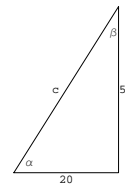
ANSWER: $429\pi = 1,347.74$ miles

b. Solve the triangle by finding the values of

i. $c =$

ii. (in degrees) $\alpha =$

iii. (in degrees) $\beta =$



c. Sketch the graph of the sinusoidal function

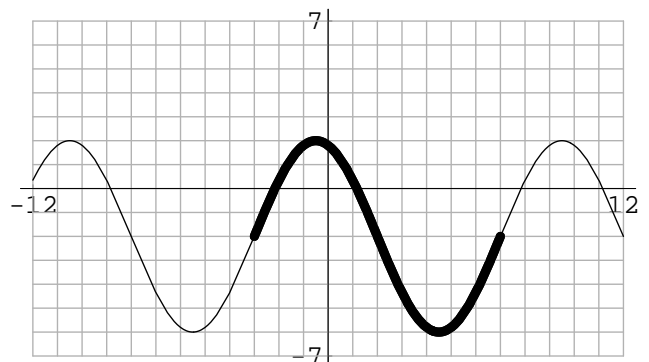
$$y = 4 \sin \left(\frac{\pi x}{5} + \frac{3\pi}{5} \right) - 2$$

ii. What is the amplitude? _____

iii. What is the vertical shift? _____

iv. What is the wavelength? _____

v. What is the phase shift (starting x-value)? _____



Practice Final Exam

MTH U121

Page 4

Name

9 Solve 2 equations: Nonlinear; Word problem: Mixture or Investment. (pg 642: 23-36) (pg 650: 50-55)

a. Solve the following system of equations.
$$\begin{array}{rcl} x - 2y & = & -6 \\ x^2 + y & = & 8 \end{array}$$

ANS: $(2, 4), (-\frac{5}{2}, \frac{7}{4})$

b. A student in a lab course requires one gallon of a 14% salt solution. The student has available a 5% salt solution and a 20% salt solution. How many gallons of each should the student mix in order to get the required salt solution?

ANS. .4 of the five percent and .6 of the twenty percent.

10. System of 3 linear equations in x, y, z . (pg 658: 15-20)

. Solve the system of linear equations for x, y and z . (*You may use your calculator to check your answer - but you still must show the computational work to receive credit.*)

$$\begin{array}{rcl} x + y + z & = & 1 \\ 2x - 3y - z & = & 0 \\ 3x + 3y - 6z & = & -6 \end{array}$$

ANSWER: $1/5, -1/5, 1$