MATH 142, Section ______ Quiz 1 (Sections 1.1 – 1.3, 1.5)

Due Friday, Sept. 19, 2014 at the beginning of class

NAME (print): key

Instructions:

- For problems 1 – 7 mark only one choice. Wrong answer will receive no credit. Each problem is worth 2 points.
- For Problem 8 present your solutions in the space provided. **Show all your work** neatly and concisely and **clearly indicate your final answer**. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading to it. Credit will not be given for an answer not supported by work.
- STAPLE ALL THE SHEETS.

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1. Find the domain of the function

$$f(x) = \begin{cases} x+4, & \text{if } x > 3 \\ \dfrac{x}{\sqrt{x+2}}, & \text{if } x \le 3 \end{cases}$$

(a) $(-\infty, \infty)$

(b) $(-\infty, 3) \cup (3, \infty)$

(c) $(-\infty, -2) \cup (-2, \infty)$

(d) $[-2, 3]$

(e) None of these

$x+4$ is defined for all x

$\frac{x}{\sqrt{x+2}}$ is defined when $x+2>0$ or $x>-2$

domain of f: $\boxed{(-2, \infty)}$

2. All of the following functions are polynomial EXCEPT:

(a) $f(x) = 2x^2 + 3x - 1$

(b) $g(x) = x - 5x^{-2} + 4x^3$

(c) $h(x) = 2x + 10 - x^4$

(d) $r(x) = x^6 - 12x + 4$

(e) None of these

[more problems on back]

3. Solve for x

$$\cancel{7}^{x^2} = \cancel{7}^{2x+3}$$

$x^2 = 2x+3$

$x^2 - 2x - 3 = 0$

$(x-3)(x+1) = 0$

$x_1 = 3, \quad x_2 = -1$

   (a) $x = -1$ and $x = 3$
   (b) $x = 0$ and $x = -\dfrac{3}{2}$
   (c) $x = 7$
   (d) $x = -3$ and $x = 1$
   (e) None of these

4. Amanda would like to remodel her kitchen in 4 years. How much should she invest now at 7% compounded monthly to have \$15,000 four years from now? Round your answer to the nearest cent.

   (a) \$10,987.43
   (b) \$25,907.67
   (c) \$16,086.99
   (d) \$11,345.98
   (e) None of these

Use TVM solver with $N = 4 \cdot 12$, $I\% = 7$

$PV = 0$

$PMT = 0$

$FV = 15000$

$C/Y = 12$

$P/Y = 12$ and then solve for PV.

5. Solve for x

$$\log_5 x + \log_5(x+3) = \log_5 10$$

$\log_5 x(x+3) = \log_5 10$

$x(x+3) = 10$

$x^2 + 3x - 10 = 0$

$(x+5)(x-2) = 0$

$\cancel{x_1 = -5}, \quad x_2 = 2$

not valid

Domain

$x > 0$

$x + 3 > 0 \Rightarrow x > -3$

intersection: $\boxed{x > 0}$

   (a) $x = 2$
   (b) $x = -5$
   (c) $x = 2$ and $x = -5$
   (d) $x = 0$ and $x = -3$
   (e) None of these

6. The financial department of a company that produces pens obtains the following price-demand equation

$$p = 35 - 0.34x$$

where p is the wholesale price in dollars per pen at which x pens are sold. The fixed costs for the company is \$200 and the variable costs is \$4.50 per pen. How many pens should be produced by the company to maximize the profit? Round the answer to the nearest integer.

   (a) 7
   (b) 83
   (c) 0
   (d) 45
   (e) None of these

Cost function: $C(x) = 4.5x + 200$

Revenue function: $R(x) = xp(x) = 35x - 0.34x^2$

Profit function: $P(x) = R(x) - C(x) = 35x - 0.34x^2 - 4.5x - 200$

$= -0.34x^2 + 30.5x - 200$

$x_{max} = \dfrac{-30.5}{2(-0.34)} = 44.86 \approx 45$

[more problems on back]

7. A company that produces and sells T-shirts established the price-demand function $p(x) = 21 - 0.1x$, where $p(x)$ is the price per T-shirt at which x T-shirts can be sold. Suppose that the company must produce at least 50 shirts and its cost equation is $C(x) = 2x + 250$. How many T-shirts must the company produce to break-even? Round your answer to the nearest T-shirt.

(a) 176
(b) 154
(c) 167
(d) 287
(e) None of these

Revenue function $R(x) = xp(x) = 21x - .1x^2$
Break-even points: $R(x) = C(x)$
$21x - .1x^2 = 2x + 250$
$.1x^2 - 19x + 250 = 0$, $x \geq 50$
$x_1 \simeq 176$, $\cancel{x_2 \simeq 14}$

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8. *[6 pts]* The quantity demanded of a certain brand of computers is 300/wk when unit price is \$450. For each decrease in unit price of \$30, the quantity demanded increases by 100 units. The company will not supply any computers if the unit price is \$250 or lower. However, they will supply 375 computers if unit price is \$325.

(a) Write the demand and supply equations.

Demand: $p - p_0 = m(x - x_0)$
[0.5pt] $p_0 = 450$, $x_0 = 300$ [0.5pt]
$m = \frac{\Delta p}{\Delta x} = \frac{30}{-100} = -0.3$ [0.5pt]
Equation: $p - 450 = -0.3(x - 300)$
or $\boxed{p = -0.3x + 540}$ [0.5pt]
Supply: $p - p_0 = m(x - x_0)$
passes through $(0, 250)$ [0.5] pt and $(375, 325)$ [0.5pt]
$m = \frac{325 - 250}{375} = 0.2 = \frac{\Delta p}{\Delta x}$ [0.5pt]
Equation: $p - 250 = 0.2x$ or $\boxed{p = 0.2x + 250}$ [0.5 pt]

(b) Find the equaibrium price and the equilibrium quantity.

Demand = supply
$-0.3x + 540 = 0.2x + 250$ [0.5pt]
intersection point $(580, 366)$ [0.5pt]
equilibrium quantity = 580 [0.5 pt]
equilibrium price = \$366 [0.5 pt]