

## MAT 170 Final Review Answers

There is a reasonable assumption that most of these answers are correct. If you find any incorrect answers, please contact your instructor as soon as possible.

### PART I – ALGEBRA

#### A. Difference quotient - Section 1.3

$$1. -\frac{1}{3x(x+h)} \quad 2. -2x+5-h \quad 3. 6x+4+3h$$

#### B. Function composition - Section 1.7

$$4. (f \circ g)(x) = 4x^2 - 14x + 16, (g \circ f)(x) = 2x^2 - 2x + 5 \quad 5. (g \circ f)(x) = 2x$$

#### C. Inverse functions - Section 1.8

$$6. f^{-1}(x) = \frac{3x}{4-x} \quad 7. f^{-1}(x) = \frac{e^{x+4} + 2}{3} \quad 8. f^{-1}(x) = \frac{\ln(x-4) + 2}{5}$$

$$9. f^{-1}(x) = \sqrt[3]{x+10}$$

#### D. Zeros of polynomials - Section 2.3-2.5

$$10. \text{ zeros are } 2, 0, -1 \quad 11. \text{ zeros are } 1, 3i, -3i$$

#### E. Domains of function $s$ - Sections 1.2-1.3

$$12. (-\infty, -3) \cup (-3, 3) \cup (3, \infty) \quad 13. \left(-\infty, \frac{2}{3}\right) \cup \left(\frac{2}{3}, \infty\right) \quad 14. \left(-\frac{1}{2}, \infty\right)$$

$$15. (-\infty, 4]$$

#### F. Exponential equations – Section 3.4

$$16. x = \log_3(7) = \frac{\ln(7)}{\ln(3)} \approx 1.77 \quad 17. x = \frac{\ln(3)}{\ln(3) - \ln(5)} \approx -2.15 \quad 18. x = \ln(9) \approx 2.197$$

#### G. Logarithmic equations – Section 3.4

$$19. x = 8 \quad 20. x = 11 \quad 21. x = \frac{2e}{e-1} \approx 3.16$$

#### H. Application of rational functions – Section 2.6

22. The insect population approaches the size of 50 million.  
23. In the long run the average cost approaches 20 dollars.

#### I. Application of quadratic functions – Section 2.2

24. Maximum time is  $5\frac{5}{9}$  seconds. Maximum height is  $89\frac{5}{6}$  feet.  
25. The minimum percentage increase in tuition was approximately 3.47% when  $x = 6.57$ .

**J. Application of exponential functions – Section 3.4**

26. a) 8.71 years b) 8.67 years c) 8.65 years      27. 17.3%

**K. Transformations – Section 1.6**

28.  $g(x) = -(x+5)^2 + 3$

**PART II – TRIGONOMETRY****L. Domain, ranges, and graph of trig functions – Sections 4.5-4.6**

29. domain  $(-\infty, \infty)$ ; range  $[-1, 1]$

30. domain  $\{x \mid x \neq n\pi \text{ where } n \text{ is an integer}\}$ ; range  $(-\infty, -1] \cup [1, \infty)$

31. domain  $\left\{x \mid x \neq \frac{\pi}{2} + n\pi \text{ where } n \text{ is an integer}\right\}$ ; range  $(-\infty, \infty)$

32. Amplitude = 3, Period =  $\pi$ , Phase shift is left by  $\frac{\pi}{2}$

**M. Pythagorean identity, summation, difference, double angle, half-angle formula problems – Sections 5.1-5.3**

33.  $-\frac{\sqrt{55}}{8}$       34.  $-\frac{8\sqrt{55}}{55}$       35.  $\frac{3\sqrt{55}}{55}$       36.  $\frac{\sqrt{55}}{3}$       37.  $-\frac{8}{3}$

38.  $\frac{23}{32}$       39.  $\frac{3\sqrt{55}}{32}$       40.  $\frac{3\sqrt{55}}{23}$       41.  $-\frac{\sqrt{8-\sqrt{55}}}{4}$       42.  $\frac{\sqrt{8+\sqrt{55}}}{4}$

43.  $\frac{-9+4\sqrt{55}}{40}$       44.  $\frac{-3\sqrt{55}+12}{40}$

**N. Inverse trigonometric functions – Section 4.7**

45.  $\sqrt{1-9x^2}$

46.  $\frac{1}{\sqrt{1+x^2}}$

**O. Trig identities – Section 5.1**

47. – 49. see instructor

**P. Trig equations – Section 5.5**

50.  $\frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{4}, \frac{7\pi}{4}$

51.  $\frac{\pi}{6}, \frac{5\pi}{6}$

**Q. Arc length – Section 4.1**

52. 318 miles

**R. Law of Sines and Law of Cosines – Sections 6.1 and 6.2**

53. two possible answers:  $B_1 \approx 33.68^\circ$ ,  $C_1 \approx 131.32^\circ$ ,  $c_1 \approx 20.31$  or  $B_2 \approx 146.32^\circ$ ,  $C_2 \approx 18.68^\circ$ ,  $c_2 \approx 8.66$

54. 2969.05 meters

55. approximately 153.968 miles

56.  $102.7^\circ$

**S. Vectors and Dot Product – Sections 6.6-6.7**

57. a.  $16\mathbf{i} - 11\mathbf{j}$

b.  $-5\mathbf{i} + \mathbf{j}$

58. a. 9

b.  $\sqrt{37}$

c.  $\sqrt{52}$

d.  $\theta = \cos^{-1}\left(\frac{9}{\sqrt{37}\sqrt{13}}\right) \approx 65.8^\circ$