The following 20 multiple choice questions are worth 5 points each.

1. Solve for n: $I = \dfrac{nr + R}{nE}$

   a. $n = R(r + IE)$

   b. $n = \dfrac{IR}{Ir - E}$

   c. $n = \dfrac{R}{IE - r}$

   d. $n = R(IE - r)$

   e. $n = \dfrac{R}{IE + r}$

2. Find the slope of the line perpendicular to the line $Ax + By = C$.

   a. $m = \dfrac{B}{A}$

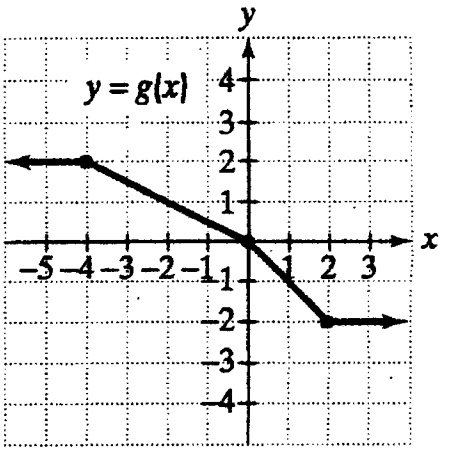
   b. $m = -\dfrac{B}{A}$

   c. $m = \dfrac{-A + C}{B}$

   d. $m = \dfrac{A}{B}$

   e. $m = -\dfrac{A}{B}$

3. Given the graph to the right, determine which of the following is NOT true.



   a. $g(1) = -1$

   b. $g(x) \geq 0$ on $[0,2]$

   c. $g(x)$ is decreasing on $(-4,2)$

   d. The domain of g is $(-\infty,\infty)$

   e. The range of g is $[-2,2]$

4. Solve: $\frac{4x-3}{6}+2>\frac{10x+2}{12}$

a. $(8,\infty)$

b. $\left(-\infty,\frac{19}{2}\right)$

c. $(-3,\infty)$

d. $(-\infty,-3)$

e. $(-\infty,8)$

5. Given $f(x)=-x^2-3x+1$, find and simplify the difference quotient: $\frac{f(x+h)-f(x)}{h}$

a. $2x+h^2-3x$

b. $2x^2+2$

c. $-2x-h-3$

d. $-2x+h-6$

e. $-2x^2-h^2-3$

6. Let $(-6,2)$ be a point on the graph of $y=f(x)$. Under the transformation $y=\frac{1}{2}f(x-3)+6$ the point $(-6,2)$ will be translated to what point?

a. $(-4\frac{1}{2},8)$

b. $(-3,4)$

c. $(-\frac{1}{2},8)$

d. $(-3,7)$

e. $(-9,4)$

7. Let $f(x)=(x-1)$ and $g(x)=\sqrt{x+3}$. Determine the domain of $\left(\frac{g}{f}\right)(x)$.

a. $(1,\infty)$

b. $(-\infty,1)\cup(1,\infty)$

c. $[-3,\infty)$

d. $(-\infty,-3)\cup(-3,1)\cup(1,\infty)$

e. $[-3,1)\cup(1,\infty)$

8. Let $f(x)=(x-5)^3$. Determine the equation for $f^{-1}(x)$.

a. $f^{-1}(x)=\frac{1}{(x-5)^3}$

b. $f^{-1}(x)=\sqrt[3]{x+5}$

c. $f^{-1}(x)=\sqrt[3]{x}+5$

d. $f^{-1}(x)=-(x-5)^3$

e. $f^{-1}(x)=\sqrt[3]{x}+\sqrt[3]{5}$

9. Let $f(x)=\frac{x-7}{8}$ and $g(x)=3x-8$. Determine $(g\circ f)(x)$.

a. $(g\circ f)(x)=\frac{3x^2-29x+56}{8}$

b. $(g\circ f)(x)=\frac{3x-71}{8}$

c. $(g\circ f)(x)=\frac{3x-85}{8}$

d. $(g\circ f)(x)=\frac{4x-15}{8}$

e. $(g\circ f)(x)=\frac{3x-15}{8}$

10. A rectangular field bordered on one side by a river is divided into two equal corrals by three wooden fences (of equal length perpendicular to the river). A stone wall is parallel to the river and connects to the wooden fences to form the corrals. The area of the field is 350 square feet. It costs \$12 per linear foot for the wooden fances and \$25 per linear foot for the stone wall. Express the cost to enclose the the field, C, as a function of its dimension x, the length of the wooden fence.

a. $C(x)=36x+\frac{8750}{x}$

b. $C(x)=\frac{375}{x}+12x$

c. $C(x)=24x+25y$

d. $C(x)=36x+\frac{25}{x}$

e. $C(x)=\frac{14}{x}+36x$

11. Determine the equation of the quadratic function with vertex at $(-5,7)$ and another point at $(-8,-2)$.

a. $f(x)=\frac{5}{9}(x+8)^2-2$

b. $f(x)=(x+5)^2+7$

c. $f(x)=-\frac{5}{169}(x+5)^2+7$

d. $f(x)=(x+5)^2+7$

e. $f(x)=-\frac{9}{169}(x-5)^2+7$

12. Let $\log_b 2=A$ and $\log_b 3=C$. Write the following expression in terms of A and C.
$\log_b 81-\log_b 6$

a. $\frac{4AC-C}{A}$

b. $3C+A$

c. $5C+A$

d. $3C-A$

e. None of the preceding.

13. A building 290 feet tall casts a 60 ft shadow. If a person stands at the end of the shadow and looks up to the top of the building, what is the angle of elevation from the person to the top of the building? Round to the nearest tenth of a degree.

a. 78.3°

b. 11.9°

c. 58.4°

d. 11.7°

e. 78.1°

14. A laboratory is performing an experiment with bacteria growth. Three samples have the following growth models, where A is the number of bacteria present after t hours.

Sample X: $A = 140e^{0.37t}$

Sample Y: $A = 160e^{0.25t}$

Sample Z: $A = 121e^{0.19t}$

Determine which of the following are true.

I. Sample X has the fastest growth rate.
II. When the experiment began, Sample Y had 160 bacteria.
III. It will take about 5 hours for the bacteria in Sample Z to double.

a. Only I and III are true.

b. Only II and III are true.

c. Only I and II are true.

d. None are true.

e. All are true.

15. If you invest \$500 into an account paying 5% interest, compounded annually, how long will it take to grow to \$1200? Use $A = P\left(1+\frac{r}{n}\right)^{nt}$. Round to the nearest year.

a. 17 years

b. 127 years

c. 1 year

d. 18 years

e. 145 years

16. Evaluate the expression: $2\tan\frac{\pi}{4} + \cos\frac{\pi}{3}\csc\frac{\pi}{6}$

a. $\frac{8+\sqrt{3}}{4}$

b. $2+\sqrt{3}$

c. $1+\sqrt{2}$

d. $\sqrt{2}+\sqrt{3}$

e. 3

17. Given that $\theta = \frac{67\pi}{6}$, determine which of the following is/are true.

I. The terminal side of θ is located in quadrant III.

II. $\cot\theta = -\sqrt{3}$

III. $\cos\theta = -\frac{\sqrt{3}}{2}$

a. None are true.

b. Only I and III are true.

c. All are true.

d. Only I and II are true.

e. Only II and III are true.

18. Given $y = 4\cos\left(3x - \frac{\pi}{2}\right)$, determine which of the following is/are true.

I. The period is $\frac{2\pi}{3}$.

II. The amplitude is 3.

III. The phase shift is $\frac{\pi}{6}$ (to the right).

IV. The phase shift is $\frac{\pi}{2}$ (to the right).

a. None are true.

b. Only I, II and III are true.

c. Only I, II and IV are true.

d. Only I and III are true.

e. Only II and IV are true.

19. Determine an equivalent expression to $\sin\left(x + \frac{\pi}{2}\right)$.

a. $-\sin x$

b. $\tan x$

c. $\cos x$

d. $\sin x$

e. $-\cos x$

20. Determine all solutions in $[0, 2\pi)$ of the trigometric equation: $5\sin\theta + 1 = 3\sin\theta$

a. $\theta = \frac{7\pi}{6}, \frac{11\pi}{6}$

b. $\theta = \frac{\pi}{3}, \frac{2\pi}{3}$

c. $\theta = \frac{\pi}{6}, \frac{5\pi}{6}$

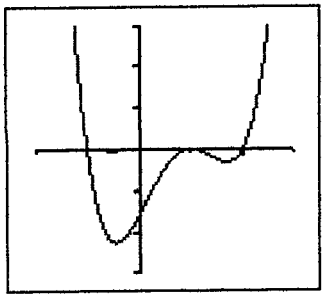
d. $\theta = \frac{5\pi}{4}, \frac{7\pi}{4}$

e. $\theta = \frac{4\pi}{3}, \frac{5\pi}{3}$

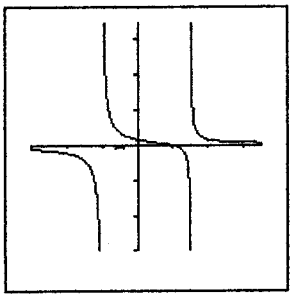
The following 5 multiple choice questions are worth 2 points each.

Use the graphs below for questions 21-25.

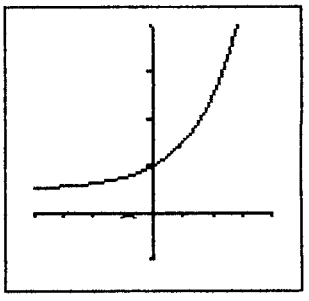
a.



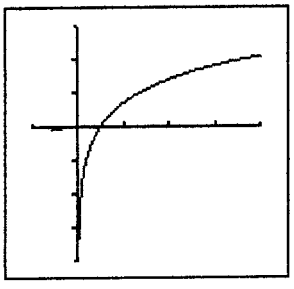
b.



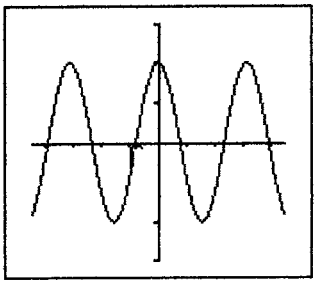
c.



d.



e.



Determine the graph which best represents each fuction type. Each graph should be used once.

21. _____ Rational

22. _____ Trigonometric

23. _____ Logarithmic

24. _____ Polynomial

25. _____ Exponential

Questions 21 – 25 are multiple choice.

Please remember to bubble in on the answer sheet.

The following 15 multiple choice questions are worth 2 points each.

Determine domain, range and asymptote for each of the following functions. Choose your answers from the appropriate list. **Any answer may be used more than once.**

$f(x)=x^2-2x+6$ $\quad$ $g(x)=-(x+3)^2(x-5)^2$ $\quad$ $h(x)=\dfrac{3x+3}{x-5}$

$k(x)=\log_5(x-5)+2$ $\quad$ $r(x)=e^{x-3}+5$

Domain Choices	Range Choices	Asymptote Choices
a. $(-\infty,\infty)$	a. $(-\infty,\infty)$	a. none
b. $(-\infty,5)\cup(5,\infty)$	b. $(-\infty,0]$	b. $x=3$
c. $(5,\infty)$	c. $[5,\infty)$	c. $x=5$
d. $(-\infty,3)$	d. $(5,\infty)$	d. $y=3$
e. $(-\infty,0]$	e. $(-\infty,3)\cup(3,\infty)$	e. $y=5$

Domain	Range	Asymptote
26. $f(x)$ ____	31. $f(x)$ ____	36. $g(x)$ ____
27. $g(x)$ ____	32. $g(x)$ ____	37. $h(x)$ ____ (vertical)
28. $h(x)$ ____	33. $h(x)$ ____	38. $h(x)$ ____ (horizontal)
29. $k(x)$ ____	34. $k(x)$ ____	39. $k(x)$ ____
30. $r(x)$ ____	35. $r(x)$ ____	40. $r(x)$ ____

Questions 26 – 40 are multiple choice.

Please remember to bubble in on the answer sheet.

Name _____ Instructor _____ Section _____

Problems 41 and 42 are free response. Page 10 should be turned in with your Answer Sheet.

41. (5 pts) Verify the identity: $1 - \dfrac{\sin^2 x}{1+\cos x} = \cos x$

42. (5 pts) Verify the identity: $\cos^2 x \tan^2 x + \cos 2x = \cos^2 x$

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Question	Answer	Question	Answer
1	C	21	B
2	A	22	E
3	B	23	D
4	E	24	A
5	C	25	C
6	D	26	A
7	E	27	A
8	C	28	B
9	C	29	C
10	A	30	A
11	No Correct Answer	31	C
12	D	32	B
13	A	33	E
14	C	34	A
15	D	35	D
16	E	36	A
17	B	37	C
18	D	38	D
19	C	39	C
20	A	40	E

Name _____ Instructor _____ Section _____

Problems 41 and 42 are free response. Page 10 should be turned in with your Answer Sheet.

41. (5 pts) Verify the identity: $1 - \dfrac{\sin^2 x}{1+\cos x} = \cos x$

$$1 - \frac{1-\cos^2 x}{1+\cos x}$$

$$1 - \frac{(1-\cos x)(1+\cos x)}{1+\cos x}$$

$$1 - (1-\cos x)$$

$$1 - 1 + \cos x$$

$$\cos x$$

$$\cos x$$

42. (5 pts) Verify the identity: $\cos^2 x \tan^2 x + \cos 2x = \cos^2 x$

$$\cos^2 x \cdot \frac{\sin^2 x}{\cos^2 x} + (\cos^2 x - \sin^2 x)$$

$$\sin^2 x + \cos^2 x - \sin^2 x$$

$$\cos^2 x$$

$$\cos^2 x$$