

Midterm Final

Evaluate each function.

1)  $f(n) = 4n - 2$ ; Find  $f(-3)$

- A) -14
- B) 22
- C) 34
- D) -42

2)  $f(x) = \frac{2}{3}x - \frac{1}{2}$ ; Find  $f\left(\frac{9}{7}\right)$

- A)  $-\frac{13}{18}$
- B)  $\frac{5}{6}$
- C)  $\frac{5}{14}$
- D)  $-\frac{13}{10}$

3)  $k(x) = -4x$ ; Find  $k\left(\frac{x}{2}\right)$

- A)  $4x$
- B)  $12x$
- C)  $-2x$
- D)  $-12x$

Find the inverse of each function.

4)  $g(x) = \frac{3}{x-2}$   *$y = \frac{3}{x-2}$*

- A)  $g^{-1}(x) = \frac{4}{-x-1} - 2$   *$(y-2)x = \frac{3}{y-2}$*
- B)  $g^{-1}(x) = \frac{2}{x-2} + 1$   *$\frac{(y-2)x = 3}{x}$*
- C)  $g^{-1}(x) = -\frac{2}{-x+3} + 1$   *$y-2 = \frac{3}{x}$*
- D)  $g^{-1}(x) = \frac{3}{x} + 2$   *$y = \frac{3}{x} + 2$*

5)  $f(x) = \frac{1}{x-2} - 2$   *$x = \frac{1}{y-2} - 2$*

- A)  $f^{-1}(x) = \frac{1}{x+2} + 2$   *$(x-y)x+2 = \frac{1}{y-2}$*
- B)  $f^{-1}(x) = \frac{3}{x} - 2$   *$(y-2)(x+2) = 1$*
- C)  $f^{-1}(x) = -\frac{3}{x-1} + 2$   *$\frac{1}{x+2}$*
- D)  $f^{-1}(x) = \frac{1}{x} + 1$   *$\frac{1}{x+2} + 2$*

Perform the indicated operation.

6)  $g(x) = x^3 - 3x^2$   
 $h(x) = 4x - 3$   
 Find  $(g \cdot h)(x)$   *$g(x) \cdot h(x)$*

- A)  $4x^4 - 15x^3 + 9x^2$   *$(x^3 - 3x^2)(4x - 3)$*
- B)  $-3x^2 - 6x + 9$
- C)  $3x^4 + 4x^3 - 3x - 4$
- D)  $2x^2 - 5x - 25$

7)  $h(x) = x^2 + 4$   
 $g(x) = 2x - 5$   
 Find  $(h + g)(x)$   *$(x^2 + 4) + (2x - 5)$*

- A)  $x^2 + 2x - 1$   *$x^2 + 2x - 1$*
- B)  $x^2 - 2x - 1$
- C)  $x + 1$
- D)  $x^2 - 5x + 2$

8)  $g(x) = 3x^3 - 2x^2$   $g(h(x))$   
 $h(x) = x + 2$   
 Find  $(g \circ h)(x)$   $g(x+2)$   
 $= 3(x+2)^3 - 2(x+2)^2$

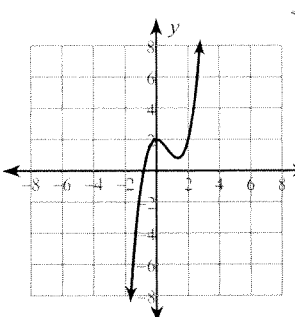
A)  $3x^3 - 2x^2 + 2$   
 B)  $27x^2 + 9x$   
 C)  $3x^3 + 16x^2 + 28x + 16$   
 D)  $-3x^3 - 2x^2 + 2$

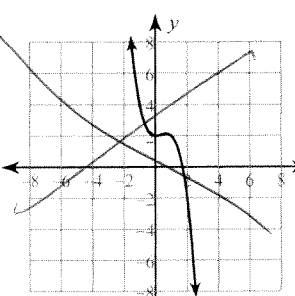
9)  $g(a) = -a + 3$   $g(f(3)) = g(3(3)^2 + 4)$   
 $f(a) = 3a^2 + 4$   
 Find  $(g \circ f)(3)$   $= g(31)$

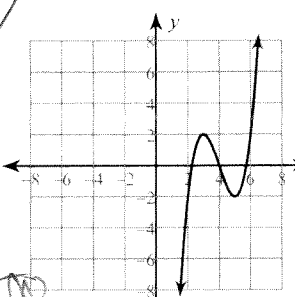
A) -13    B) -28    = -28  
 C) 112    D) 4

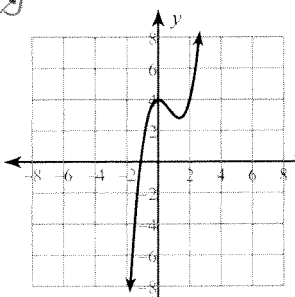
Sketch the graph of each function.

10)  $f(x) = x^3 - 12x^2 + 45x - 52$

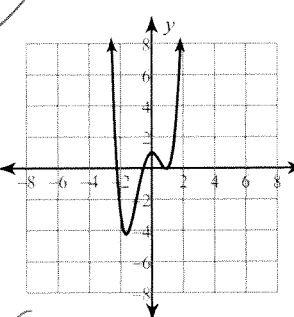
A)  *\* Use the ~~intercepts!~~ and end behavior. Positive, odd degree means as  $x \rightarrow \infty, y \rightarrow \infty$  as  $x \rightarrow -\infty, y \rightarrow -\infty$  So B is out*

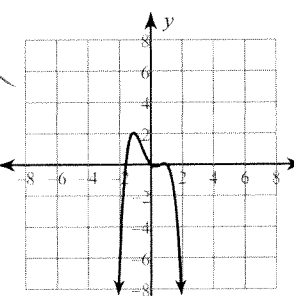
B)  *find y-int:  $f(0) = -52$  So ~~"C"~~ is the only logical choice!*

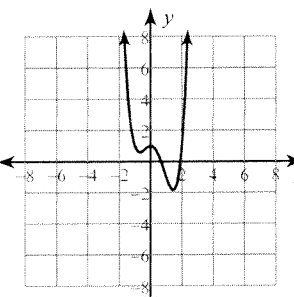
C)  *So ~~"C"~~ is the only logical choice!*

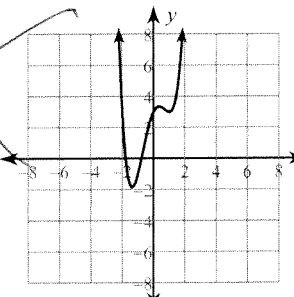
~~D)~~ 

11)  $f(x) = x^4 + x^3 - 3x^2 + 1$

A)  *y-int:  $f(0) = 1$  So B and D are out!*

B)  *plug in ~~2~~  $f(2) = 2^4 + 2^3 - 3(2)^2 + 1 = 16 + 8 - 12 + 1 \neq 0$  So C is out.*

C) 

~~D)~~ 

**Find all zeros.**

12)  $f(x) = 3x^2 - 13x + 12$

- A)  $\left\{\frac{4}{3}, -3\right\}$       B)  $\left\{\frac{4}{3}, -1\right\}$   
 C)  $\left\{\frac{4}{3}, -4\right\}$       **D)  $\left\{\frac{4}{3}, 3\right\}$**

factor.  
 $(3x - 4)(x - 3) = 0$   
 $x = \frac{4}{3}, 3$

**State the possible rational zeros for each function. Then find all zeros.**

13)  $f(x) = x^3 + 8x^2 + 14x + 4$

- A) Possible rational zeros:  $\pm 1, \pm 2, \pm 4$   
 Zeros:  $\{-1, -3 + \sqrt{7}, -3 - \sqrt{7}\}$   
 B) Possible rational zeros:  $\pm 1, \pm 2, \pm 4$   
 Zeros:  $\{-2, -3 + \sqrt{7}, -3 - \sqrt{7}\}$   
 C) Possible rational zeros:  $\pm 1, \pm 2, \pm 4$   
 Zeros:  $\{-2, -4 + \sqrt{14}, -4 - \sqrt{14}\}$   
**D) Possible rational zeros:  $\pm 1, \pm \frac{1}{2}, \pm \frac{1}{4}$**   
 Zeros:  $\{-1, -3 + \sqrt{7}, -3 - \sqrt{7}\}$

$\frac{+p}{-q} = \pm \frac{\text{factors of } p}{\text{factors of } q}$

$= \pm 1, \pm 2, \pm 4$

plug in "-1" =  $f(-1) = -1 + 8 - 14 + 4 \neq 0$

So A is out.

use synthetic division since we know -2 is a zero

$$\begin{array}{r|rrrrr} -2 & 1 & 8 & 14 & 4 & \\ & & -2 & -12 & -4 & \\ \hline & 1 & 6 & 2 & 0 & \end{array}$$

$\Rightarrow f(x) = (x+2)(x^2+6x+2)$

Quadratic formula.

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-6 \pm \sqrt{36 - 4(1)(2)}}{2} = \frac{-6 \pm \sqrt{28}}{2} = \frac{-6 \pm 2\sqrt{7}}{2}$$

**Divide.**

14)  $(a^5 - 2a^4 - 3a^2 + 6a - 6) \div (a - 2)$

- A)  $a^4 - 3a - \frac{4}{a-2}$   
 B)  $a^4 - 3a - 2 - \frac{9}{a-2}$   
 C)  $a^4 - 3a - 1 - \frac{3}{a-2}$   
**D)  $a^4 - 3a - \frac{6}{a-2}$**

use synthetic.  
 think opposite sign!  

$$\begin{array}{r|rrrrrr} 2 & 1 & -2 & 0 & -3 & 6 & -6 \\ & & 2 & 0 & 0 & -6 & 0 \\ \hline & 1 & 0 & 0 & -3 & 0 & -6 \end{array}$$

**Simplify.** get "i" out of the denominator.

15)  $\frac{10}{-9i} \cdot i = \frac{10i}{-9i^2} = \frac{10i}{-9(-1)} = \frac{10i}{9}$   
 A)  $\frac{11i}{9}$       B)  $i$   
 C)  $\frac{8i}{9}$       **D)  $\frac{10i}{9}$**

16)  $\frac{6+10i}{9-4i} \cdot \frac{(9+4i)}{(9+4i)}$   
**A)  $\frac{14+114i}{97}$**       B)  $\frac{2+94i}{65}$   
 C)  $\frac{6+10i}{5}$       D)  $\frac{126+56i}{97}$

$$17) (8 + 8i)(-6 + 4i)$$

- A)  $16 + 80i$       B)  $-16 + 80i$   
 C)  $16 - 80i$       **D)  $-80 - 16i$**

$$18) (3 + 6i) - (-7 - 4i)$$

- A)  $4 - 2i$       **B)  $10 + 10i$**   
 C)  $-4 + 10i$       D)  $10 + 2i$

Find the exact value of each trigonometric function.

*Unit Circle!!*

$$19) \sec \frac{\pi}{3} = \frac{1}{\cos \pi/3}$$

- A)  $-\frac{\sqrt{3}}{2}$       B)  $\frac{\sqrt{3}}{3}$   
**C) 2**      D)  $\sqrt{2}$

$$20) \sin -\frac{\pi}{6} = -\sin \pi/6 \quad (\text{Refer to even/odd properties})$$

- A)  $\frac{\sqrt{3}}{2}$       **B)  $-\frac{1}{2}$**   
 C)  $\sqrt{3}$       D)  $-\sqrt{3}$

$$21) \cos \frac{3\pi}{2}$$

- A)  $-1$       B)  $-\frac{1}{2}$   
 C)  $\frac{2\sqrt{3}}{3}$       **D) 0**

$$22) \sec 0$$

- A) 1**      B)  $-2$   
 C) Undefined      D)  $\sqrt{2}$

$$\frac{15\pi}{4} = 2\pi + \frac{7\pi}{4}$$

$$23) \csc \frac{\pi}{2}$$

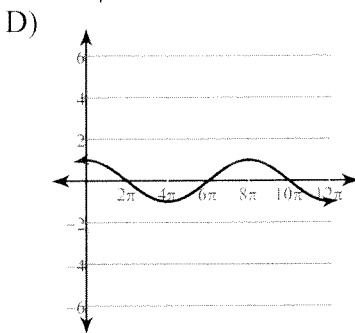
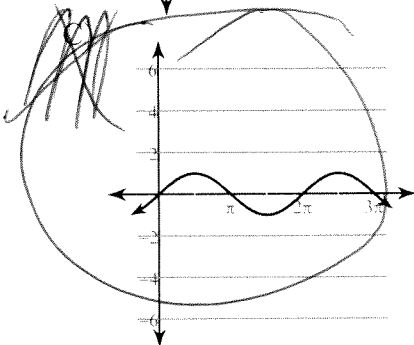
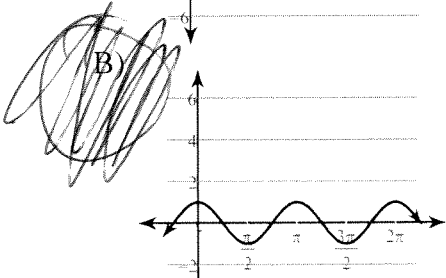
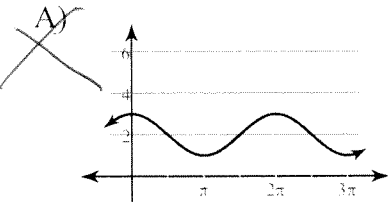
- A)  $-1$       B) 0  
 C) Undefined      **D) 1**

$$24) \cot \frac{15\pi}{4} = \cot 7\pi/4$$

- A)  $-\frac{1}{\sqrt{3}}$**       B)  $\sqrt{2}$   
 C) 2      D)  $-\sqrt{3}$

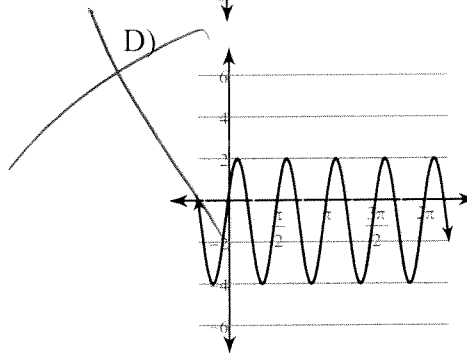
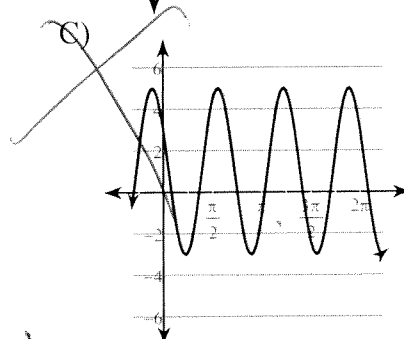
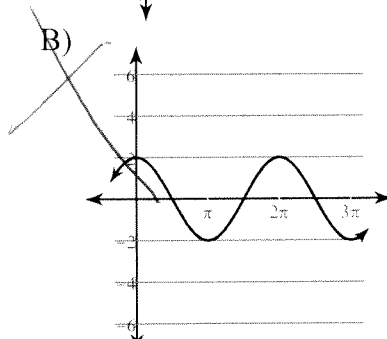
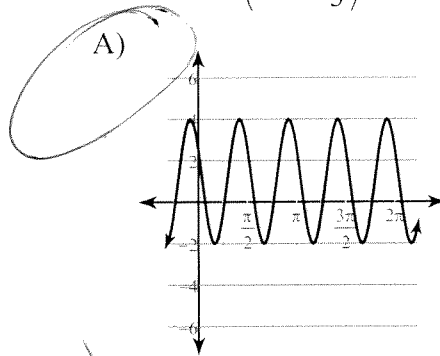
Graph each function using radians.

25)  $y = \sin \theta \Rightarrow$  amp: 1



26)  $y = 3\cos\left(4\theta + \frac{\pi}{3}\right) + 1$

amp: 3  
peri:  $\frac{2\pi}{4}$



Find the value of the trig function indicated.

Soh Cah Toa

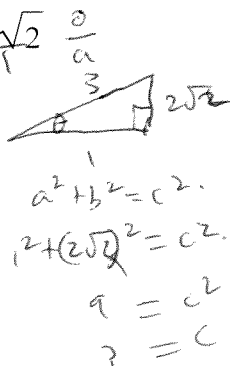
27) Find  $\csc \theta$  if  $\tan \theta = 2\sqrt{2}$

A) 3

B)  $\frac{\sqrt{5}}{5}$

C)  $\frac{4}{3}$

D)  $\frac{3\sqrt{2}}{4}$



$\csc = \frac{1}{\sin} = \frac{h}{o}$

28) Find  $\cos \theta$  if  $\sec \theta = \frac{5\sqrt{10}}{13}$


$\Rightarrow \cos \theta = \frac{13}{5\sqrt{10} \cdot \sqrt{10}}$

A)  $\frac{13\sqrt{10}}{50}$

B)  $\frac{24}{7}$

C)  $\frac{5}{4}$

D)  $\frac{7}{24}$

29) Find  $\sin \theta$  if  $\cot \theta = \frac{3}{4}$  

- A)  $\frac{5}{3}$       B)  $\frac{3}{4}$   
 C)  $\frac{4}{5}$       D)  $\frac{5}{4}$

30) Find  $\tan \theta$  if  $\sec \theta = \frac{25}{7}$

- A)  $\frac{24}{25}$       B)  $\frac{25}{24}$   
 C)  $\frac{5}{3}$       D)  $\frac{24}{7}$

Solve each equation. Round your answers to the nearest ten-thousandth.

31)  $10^{-3v} - 1 = -1 \Rightarrow 10^{-3v} = 0$   
 A) No solution.      B) -0.02  
 C) -0.04      D) 0.02  
 Exponential  $\neq 0$ .

32)  $14^{-6p} - 3 = 83$   
 A) -0.7527      B) -0.2813  
 C) -0.3224      D) -0.7424  
 $\log_{14}(14^{-6p}) = \log_{14}(86)$   
 $-\frac{6p}{1} = \frac{\log_{14}(86)}{-6}$

Simplify. Your answer should contain only positive exponents.

33)  $x^4 y^2 \cdot 2x^2 y^2 = 2x^6 y^4$   
 A)  $\frac{6y^4}{x}$       B)  $\frac{9}{y^4 x^2}$   
 C)  $2x^6 y^4$       D)  $3yx$

34)  $4xy^{-1} \cdot yx^{-1} \cdot 3x^{-1} y^3 = \frac{4x}{y} \cdot \frac{y}{x} \cdot \frac{3y^3}{x} = \frac{12y^3}{x}$   
 A)  $3x^7$       B)  $\frac{12y^3}{x}$   
 C)  $\frac{8y^8}{x^2}$       D)  $\frac{8}{y^7 x^2}$

Solve each equation.

35)  $\log_{14} -3r = \log_{14} 27$   
 A)  $\{1\}$       B)  $\{\frac{4}{3}\}$   
 C)  $\{-9\}$       D)  $\{\frac{1}{2}\}$   
 $-3r = 27$   
 $r = -9$

36)  $\log_{20} 28 = \log_{20} (4x + 8)$   
 A)  $\{-2\}$       B)  $\{\frac{13}{12}\}$   
 C)  $\{5\}$       D)  $\{0\}$   
 $28 = 4x + 8$   
 $20 = 4x$   
 $5 = x$

37)  $\log_7 9 + \log_7 4x^2 = 2 \Rightarrow \log_7 (36x^2) = 2$   
 A)  $\{1, -1\}$       B)  $\{1\}$   
 C)  $\{\frac{7}{6}, -\frac{7}{6}\}$       D) No solution.  
 $36x^2 = 49$   
 $x^2 = \frac{49}{36}$   
 $x = \pm \frac{7}{6}$

38)  $\log_5 10 - \log_5 -2x = 1 \Rightarrow \log_5 (\frac{10}{-2x}) = 1$   
 A)  $\{\frac{25}{4}\}$       B) No solution.  
 C)  $\{-\frac{4}{25}\}$       D)  $\{-1\}$   
 $\frac{10}{-2x} = 5$   
 $2x = \frac{10}{5} = 2$   
 $x = -1$

Use a calculator to approximate each to the nearest thousandth.

39)  $\log_5 27 = \frac{\log 27}{\log 5}$  use change of base formula if needed.  
 A) 1.454      B) 2.168  
 C) 2.048      D) 1.295

40)  $\log_2 51$   
 A) 4.143      B) 5.672  
 C) 6.2      D) 6.044

or  $\frac{\ln 27}{\ln 5}$

**Condense each expression to a single logarithm.**

41)  $10 \log_4 a - 5 \log_4 b \Rightarrow \log_4 a^{10} - \log_4 b^5$

- A)  $\log_4 \frac{a^{10}}{b^5} = \log_4 \frac{a^{10}}{b^5}$
- B)  $\log_4 (c \sqrt[3]{ba})$
- C)  $\log_4 \sqrt[3]{cba}$
- D)  $\log_4 (b^{10} a^5)$

42)  $3 \log_2 10 + 5 \log_2 11 = \log_2 (10^3 \cdot 11^5)$

- A)  $\log_2 \frac{10^3}{11^5}$
- B)  $\log_2 (11^5 \cdot 10^3)$
- C)  $\log_2 \sqrt{770}$
- D)  $\log_2 (11^{15} \cdot 10^5)$

**Expand each logarithm.**

43)  $\log_5 (a^2 \cdot b)^4 \Rightarrow 4 \log_5 (a^2 \cdot b) = 4(2 \log_5 a + \log_5 b)$

- A)  $\log_5 a + \log_5 b + 2 \log_5 c$
- B)  $8 \log_5 a + 4 \log_5 b = 4(2 \log_5 a + \log_5 b)$
- C)  $\frac{\log_5 a}{3} + \frac{\log_5 b}{3} + \frac{\log_5 c}{3}$
- D)  $\log_5 c + \frac{\log_5 a}{3} + \frac{\log_5 b}{3}$

44)  $\log_7 (u \cdot v \cdot w^5) = \log_7 u + \log_7 v + 5 \log_7 w$

- A)  $5 \log_7 u - 25 \log_7 v$
- B)  $25 \log_7 u - 5 \log_7 v$
- C)  $\log_7 u + \log_7 v + 5 \log_7 w$
- D)  $\frac{\log_7 u}{3} + \frac{\log_7 v}{3} + \frac{\log_7 w}{3}$

**Solve each equation for  $0 \leq \theta < 2\pi$ .**

45)  $\frac{\sqrt{3}}{4} = -\frac{1}{4} \cdot \tan \theta$   
 $-\sqrt{3} = \tan \theta$

46)  $-\frac{1}{5} \cdot \sin \theta = \frac{1}{5}$

47)  $3 + \cos \theta = \frac{6 - \sqrt{3}}{2}$

48)  $-3 = -3 + \sin \theta$

49)  $0 = \csc \theta$

50)  $-2 + \sec \theta = \frac{-6 - 2\sqrt{3}}{3}$

51)  $-3 + \csc \theta = -4$

52)  $\sec \theta = 2$

Do not do!

Find the value of the trig function indicated. *Soh Cah Toa.*

53)  $\csc \theta$

$23^2 - 12^2 = c^2$

$\csc \theta = \frac{h}{a}$

~~$\frac{23\sqrt{2}}{23}$~~

55)  $\sec \theta$

$7^2 + b^2 = 25^2$

$49 + b^2 = 625$

$b^2 = 24$

~~$b = 24$~~

$\frac{25}{24}$

54)  $\sin \theta$

$\frac{4}{10} = \frac{2}{5}$

$6^2 + b^2 = 10^2$

$36 + b^2 = 100$

$b^2 = 64$

$b = 8$

56)  $\sec \theta$

$\frac{12}{4\sqrt{13}}$

$\frac{12}{4\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{12\sqrt{13}}{4\sqrt{13}}$

$\frac{3\sqrt{13}}{13}$

$12^2 + b^2 = (4\sqrt{13})^2$

$144 + b^2 = 16(13)$

$b^2 = \frac{208}{144} = \frac{13}{9}$

~~$b = \frac{13}{9}$~~

$b = \frac{\sqrt{13}}{3}$

$\frac{\sqrt{13}}{3}$