State Senior Mathematics Contest
Spring 2007

1. What is the greatest divisor of 19! and 19! + 17?

   (a) 1 (b) 17 (c) 19 (d) 19! (e) 17!

$19! = 17(19(18)16!)$
$19! + 17 = 17(19(18)16! + 1)$

2. The decimal $0.\bar{9} = 0.999\ldots$ is equal to

   (a) 1 (b) $1-(\frac{9}{10})^{10}$ (c) $(\frac{9}{10})^{\frac{10}{9}}$ (d) 999/1000 (e) 9/10

Let $n = 0.\bar{9}$ then $10n = 9.\bar{9}$

$\Rightarrow$ $10n = 9.\bar{9}$
$- \quad n = 0.\bar{9}$
$9n = 9$

$n = 1$

3. If you lose 20% on an investment during the first year and gain 25% the following year, what is your net gain over the two years?

(a) 0% (b) 5% (c) 2.5% (d) −5% (e) 1.25%

Let x = original investment

after 1st year, investment $= 0.8x$

after 2nd year, investment $= 1.25(0.8x)$

$$= \frac{5}{4}\left(\frac{4}{5}x\right) = 1x$$

$\Rightarrow$ it is back to original value $\Rightarrow$ 0 net gain

4. How many divisors does the number **2007** have?

(a) 2 (b) 3 (c) 4 (d) 6 (e) 8

2007

9 223 prime

3 3

divisors

1, 3, 9, 223, 669, 2007

5. The number 2^{29} is a 9-digit number with distinct digits. Which digit is missing?

(*a*) 0 (*b*) 3 (*c*) 4 (*d*) 5 (*e*) 7

$2^{29} = 2^{10}2^{10}2^{9} = 1024(1024)(512)$

$$\begin{array}{r} 1024 \\ \underline{1024} \\ 4096 \\ 2048 \\ \underline{10240} \\ 1048576 \end{array} \qquad \begin{array}{r} 1048576 \\ \underline{\times\ 512} \\ 2097152 \\ 1048576 \\ \underline{5242880} \\ 536,870,912 \end{array}$$

$\Rightarrow$ 4 is missing

6. If this pattern continues, where would the number 289 apppear?

1
3 5
7 9 11
13 15 17 19

(*a*) 8^{th} element in row 16
(*b*) 9^{th} element in row 17
(*c*) 9^{th} element in row 18
(*d*) last element in row 17
(*e*) last element in row 18

1 row 1
3 5 row 2
7 9 11 row 3
13 15 17 19 row 4
21 23 25 27 29 row 5
31 33 35 37 39 41 row 6
43 45 47 49 51 53 55 row 7

perfect squares

$289 = 17^2 \Rightarrow 17^{th}$ row, in middle
$\Rightarrow 9^{th}$ element

7. Consider an infinite geometric series with first term a and common ratio r. If the sum is 4 and the second term is $\frac{3}{4}$, then a possible choice of a and r is

(a) $a = \frac{7}{4}, r = \frac{3}{7}$

(b) $a = 2, r = \frac{3}{4}$

(c) $a = \frac{3}{2}, r = \frac{1}{2}$

(d) $a = 3, r = \frac{1}{4}$

(e) $a = 1, r = \frac{1}{4}$

$a + ar + ar^2 + ar^3 + \cdots$

$$\sum_{n=0}^{\infty} ar^n = \frac{a}{1-r}, \quad |r| < 1$$

$$\frac{a}{1-r} = 4 \quad \text{and} \quad ar = \frac{3}{4}$$

$$\Leftrightarrow a = \frac{3}{4r}$$

$$\Rightarrow \frac{3/4r}{1-r} = 4$$

$$\frac{3}{4r} = 4 - 4r \Leftrightarrow 3 = 16r - 16r^2$$

$$\Leftrightarrow 16r^2 - 16r + 3 = 0$$

$$(4r-1)(4r-3) = 0$$

$$r = 1/4 \qquad r = 3/4$$

$$a = 3 \qquad a = 1$$

8. For all $x \in (0,1)$, which statement is true?

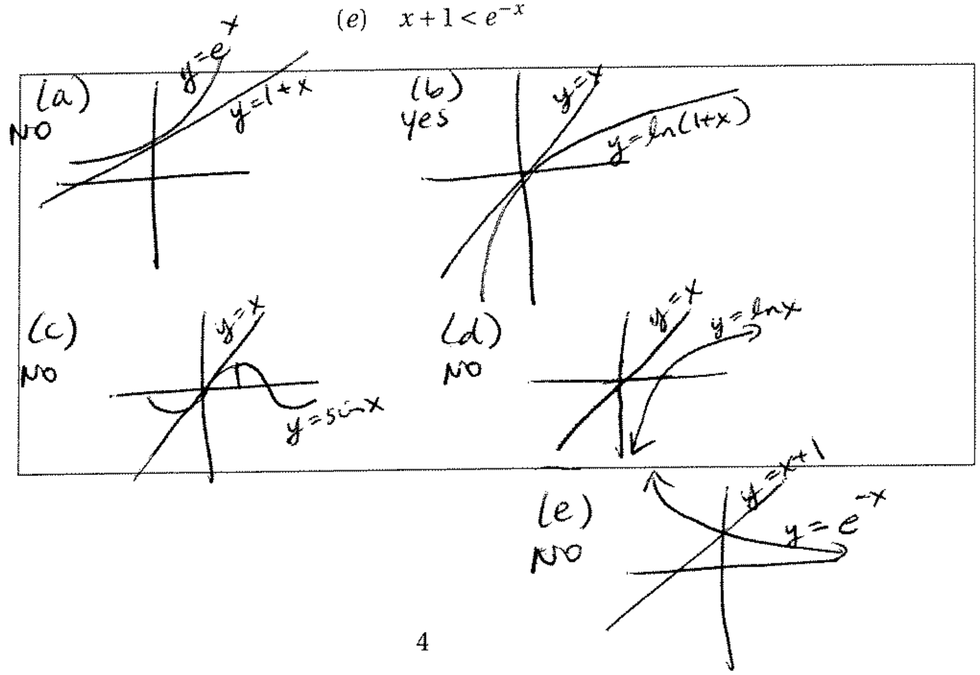
(a) $e^x < 1 + x$

(b) $\ln(1+x) < x$

(c) $x < \sin x$

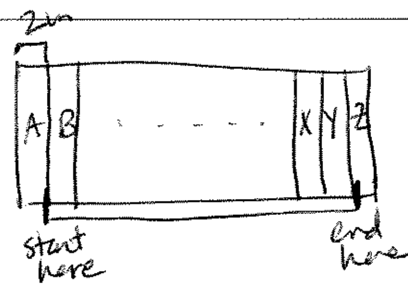
(d) $x < \ln x$

(e) $x + 1 < e^{-x}$



9. A set of 26 encyclopedias (one for each letter) is placed on a bookshelf in alphabetical order from left to right. Each encyclopedia is 2 inches thick including the front and back covers. Each cover (front or back) is 1/4 inch thick. A bookworm eats straight through the encyclopedias, beginning inside the front cover of volume A and ending after eating through the back cover of volume z. How many inches of book did the bookworm eat?

(*a*) 48 (*b*) 48.5 (*c*) 51.25 (*d*) 51.5 (*e*) 51.75



$2(26) - 1.75 - 1.75 = 52 - 3.5 = 48.5$

10. What is the smallest positive integer so that $\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} i\right)^n = 1$

(*a*) 0 (*b*) 2 (*c*) 4 (*d*) 8 (*e*) 16

We know $\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} i\right)^2 = \left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} i\right)\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} i\right)$

$= \frac{1}{2} + i - \frac{1}{2} = i$

and $i^4 = 1$

$\Rightarrow \left[\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} i\right)^2\right]^4 = 1$

or $\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} i\right)^8 = 1$

11. One hundred balls labelled 1 through 100 are placed in a bag. Four balls are removed from the bag, one by one. What is the probability that the label on the first ball is higher than the label on the last?

(a) 5/4 (b) 1/2 (c) 0 (d) 49/50 (e) 4/5

Due to symmetry, it's equally likely that 1^{st} ball > last ball as last ball > 1^{st} ball

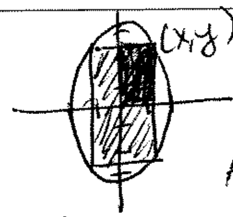
$\Rightarrow P = 1/2$.

OR $P = \dfrac{\frac{99(100)}{2}(98)(97)}{{}_{100}P_4} = \dfrac{100(99)(98)(97)}{2\left(\frac{100!}{96!}\right)} = \dfrac{1}{2}$

since ${}_{100}P_4$ = total # of 4-ball draws + there are $\frac{99(100)}{2}(98)(97)$ ways to have 1^{st} ball higher than last ball

12. What are the dimensions of the rectangle with the largest area that can be inscribed in the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$?

(a) 2×3
(b) $2\sqrt{3} \times 3\sqrt{3}$
(c) $\sqrt{3} \times \frac{3}{2}\sqrt{3}$
(d) $2\sqrt{2} \times 3\sqrt{2}$
(e) $\sqrt{2} \times \frac{3}{2}\sqrt{2}$



I'll maximize 1/4 of rectangle.

maximize $A = xy$ given $\frac{x^2}{4} + \frac{y^2}{9} = 1$

$0 < x < 2$

$A = x\left(\frac{3}{2}\sqrt{4-x^2}\right)$

$= \frac{3x}{2}\sqrt{4-x^2}$

$y^2 = 9 - \frac{9}{4}x^2$

$y = \sqrt{9 - \frac{9}{4}x^2}$

$y = \frac{3}{2}\sqrt{4-x^2}$

$\frac{dA}{dx} = \frac{3}{2}\sqrt{4-x^2} - \frac{3x^2}{2\sqrt{4-x^2}} = 0$

$3(4-x^2) - 3x^2 = 0$

$12 - 6x^2 = 0$

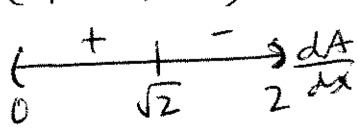
$2 = x^2$

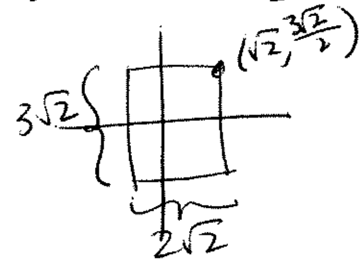
$\sqrt{2} = x$

(since $x > 0$)

$\Rightarrow x = \sqrt{2}$ makes max A

$\Rightarrow y = \frac{3}{2}\sqrt{4-2} = \frac{3\sqrt{2}}{2}$





13. If you place these expressions in increasing order, which one will be in the middle?

(a) $\sum_{k=1}^{1000}(-1)^k = \underbrace{(-1+1)+(-1+1)+\cdots+(-1+1)}_{500 \text{ pairs}} = 0$

(b) $\sum_{k=2}^{20}k^2 = \frac{20(20+1)(20(2)+1)}{6} = \frac{20(21)(41)}{6} = 70(41) = 2870$

Harmonic series diverges

(c) $\sum_{k=1}^{\infty}\frac{1}{k} = 1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\cdots \to \infty$

(d) $\sum_{k=1}^{100}k = \frac{100(100+1)}{2} = 50(101) = 5050$

(e) $\sum_{k=1}^{\infty}2\left(\frac{1}{2}\right)^k = 2\left[\sum_{k=0}^{\infty}\left(\frac{1}{2}\right)^k - 1\right] = 2\left[\frac{1}{1-\frac{1}{2}} - 1\right] = 2$

(a) 0
(e) 2
(b) 2870
(d) 5050
(c) ∞

14. The diagonals of a rhombus are 12 and 24. Determine the radius of the circle inscribed in the rhombus.

   (*a*) $6\sqrt{5}$

   (*b*) $12\sqrt{5}$

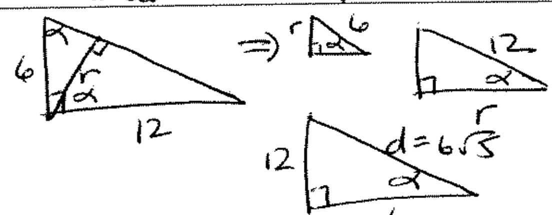
   (*c*) $\frac{6}{\sqrt{5}}$

   (*d*) $\frac{12}{\sqrt{5}}$

   (*e*) Cannot inscribe a circle in a rhombus

Diagonals of a rhombus are $\perp$ to eachother.

We have



similar Δs

$$\frac{6\sqrt{5}}{12} = \frac{6}{r}$$

$r(6\sqrt{5}) = 72$

$r = \frac{12}{\sqrt{5}}$

$6^2 + 12^2 = 180 = d^2$

$\Rightarrow d = 6\sqrt{5}$

15. If w, x, y, z are positive real numbers such that $w + x + y + z = 2$, then

$$N = (w + x)(y + z)$$

satisfies

(*a*) $0 \le N \le 1$
(*b*) $1 \le N \le 2$
(*c*) $2 \le N \le 3$
(*d*) $3 \le N \le 4$
(*e*) $4 \le N \le 5$

Try easy case $x = y = z = w = 1/2$

$\Rightarrow N = (\frac{1}{2} + \frac{1}{2})(\frac{1}{2} + \frac{1}{2}) = 1$ $\Rightarrow$ either (a) or (b)

Try $w = 3/2$ and $x = y = z = 1/6$

$\Rightarrow N = (\frac{3}{2} + \frac{1}{6})(\frac{1}{6} + \frac{1}{6}) = \frac{10}{6}(\frac{2}{6}) = \frac{5}{3}(\frac{1}{3}) = \frac{5}{9} < 1$

$\Rightarrow$ (a)

16. As $x \to \infty$, the function $\left(\frac{x-3}{x+2}\right)^x$ approaches

(a) e (b) $\frac{1}{e}$ (c) e^{-5} (d) e^5 (e) 1

★ You can also use L'Hopital's Rule here, but it is longer.

Remember defn of $e^r = \lim_{x\to\infty} \left(1+\frac{r}{x}\right)^x$

$$\left(\frac{x-3}{x+2}\right)^x = \left(\frac{x+2-5}{x+2}\right)^x = \left(1+\frac{-5}{x+2}\right)^x = \frac{\left(1+\frac{-5}{x+2}\right)^{x+2}}{\left(1+\frac{-5}{x+2}\right)^2}$$

as $x \to \infty$ $(x+2) \to \infty$ also

$$\Rightarrow \lim_{(x+2)\to\infty} \frac{\left(1+\frac{-5}{x+2}\right)^{x+2}}{\left(1+\frac{-5}{x+2}\right)^2} = \frac{\lim_{(x+2)\to\infty}\left(1+\frac{-5}{x+2}\right)^{x+2}}{\lim_{(x+2)\to\infty}\left(1+\frac{-5}{x+2}\right)^2} = \frac{e^{-5}}{1^2} = e^{-5}$$

17. Triangle ABC has sides 10, 24, and 26 cm long. A rectangle that has an area equal to that of the triangle has width 3 cm. Find the perimeter of the rectangle.

(a) 40 cm (b) 43 cm (c) 56 cm (d) 68 cm (e) 86 cm

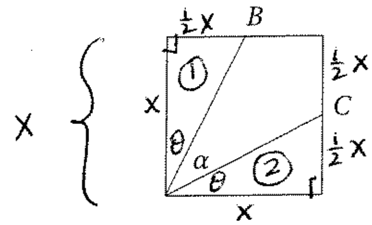
We know this is a right Δ because the side lengths are multiple of the 5-12-13 Pythagorean triple.

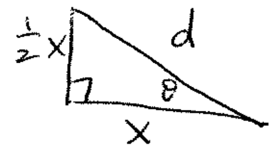
$A = \frac{1}{2}(24)(10)$
$= 120$

$A = 3x$
$\Rightarrow 120 = 3x$
$40 = x$

$\Rightarrow$ perimeter $= 2(3) + 2(x) = 6 + 2(40)$
$= 6 + 80$
$= 86$

18. Given the square with midpoints B and C. What is the $\sin\alpha$?





$$x^2 + \left(\tfrac{1}{2}x\right)^2 = d^2$$
$$d = \tfrac{\sqrt{5}}{2}x$$

$$\cos\theta = \frac{x}{\frac{\sqrt{5}}{2}x} = \frac{2}{\sqrt{5}}$$
$$\sin\theta = \frac{\frac{1}{2}x}{\frac{\sqrt{5}}{2}x} = \frac{1}{\sqrt{5}}$$

(a) $\frac{3}{5}$ (b) $\frac{4}{5}$ (c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{5}}$ (e) $\frac{2}{\sqrt{5}}$

$\Delta ① \cong \Delta ②$ by SSS

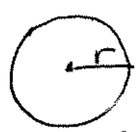
$2\theta + \alpha = 90^\circ$

$\alpha = 90^\circ - 2\theta = \pi/2 - 2\theta$

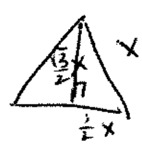
$$\sin\alpha = \sin(\pi/2 - 2\theta) = \cos(2\theta)$$
$$= \cos^2\theta - \sin^2\theta = \frac{4}{5} - \frac{1}{5} = \frac{3}{5}$$

19. If the area of a circle is equal to the area of an equilateral triangle, then the ratio of the side of the triangle to the radius of the circle is closest to which number?

(a) 3 (b) 4 (c) 5 (d) 6 (e) 7



$A_\circ = \pi r^2$



$$A_\Delta = \tfrac{1}{2}(x)\left(\tfrac{\sqrt{3}}{2}x\right) = \tfrac{\sqrt{3}}{4}x^2$$

$$A_\circ = A_\Delta \Leftrightarrow \pi r^2 = \frac{\sqrt{3}}{4}x^2 \Leftrightarrow \frac{x^2}{r^2} = \frac{4\pi}{\sqrt{3}}$$

$$\frac{x}{r} = \sqrt{\frac{4\pi}{\sqrt{3}}} = 2\sqrt{\pi/\sqrt{3}}$$

$\frac{\pi}{\sqrt{3}} \sim 1.8 \Rightarrow 2\sqrt{1.8} \sim 2(1.35)$ $= 2.7$ $\simeq 3$

(since $\sqrt{1.8} < \sqrt{2}$ ≈ 1.4)

20. If this multiplication problem works in base b, what is b?

$$(15_b)(15_b) = 321_b$$

(a) 4 (b) 6 (c) 7 (d) 8 (e) 9

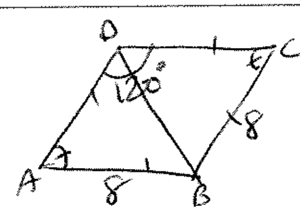
Just look at last digits. We know $5_6 \times 5_6 =$ something that ends in 1 which means the base must be one more than a group of 5's.

$\Rightarrow$ Try base 6.

$$\begin{array}{r} 15_6 \\ \times\ 15_6 \\ \hline 131 \\ 15 \\ \hline 321_6 \end{array}$$

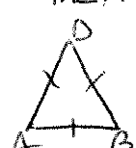
21. A rhombus with sides of 8 cm and an angle of 120^o will have an area closest to.

(a) $35\,\text{cm}^2$ (b) $45\,\text{cm}^2$ (c) $55\,\text{cm}^2$ (d) $60\,\text{cm}^2$ (e) $65\,\text{cm}^2$



$\Delta ABD \cong \Delta CBD$ by SAS

$m\angle A = 60° \Rightarrow m\angle ABD = 60°$



$A = \frac{\sqrt{3}}{4}x^2 = \frac{\sqrt{3}}{4}(8^2)$

Area $= 16\sqrt{3}$

Area of rhombus

$= 2(16\sqrt{3})$

$= 32\sqrt{3}$

$\simeq 32(1.7)$

$= 54.4$

22. If $b > a$, then the equation $(x-a)(x-b)-1=0$ has

(a) both roots in $[a, b]$
(b) both roots in $(-\infty, a)$
(c) both roots in (b, ∞)
(d) one root in $(-\infty, a)$ and the other in (b, ∞)
(e) one root in $[a, b]$ and the other in (b, ∞)

$$x^2 + (-a-b)x + (ab-1) = 0$$

$$x = \frac{(a+b) \pm \sqrt{(a+b)^2 - 4(ab-1)}}{2} = \frac{a+b}{2} \pm \frac{\sqrt{a^2-2ab+b^2+4}}{2}$$

$$x = \underbrace{\frac{a+b}{2}}_{\text{midpt of } [a,b]} \pm \underbrace{\frac{\sqrt{(a-b)^2+4}}{2}}_{\text{some stuff}}$$

$\Rightarrow$ interval is symmetric wrt $\frac{a+b}{2}$

$a \quad \frac{a+b}{2} \quad b$

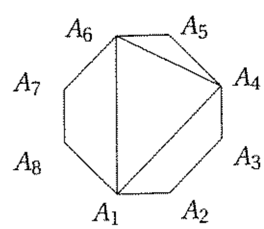
$\Rightarrow$ either (a) or (d)

but $\frac{\sqrt{(a-b)^2+4}}{2} > \frac{b-a}{2}$

$\Rightarrow$ answers are outside $[a,b]$

$\Rightarrow$ (d)

23. How many different triangles can you draw as in the figure, if the three vertices have to be among the shown points $A_1, \ldots, A_8$?



(a) 8(7)(6) (b) 56 (c) 8! (d) 3! (e) 24

8 vertices, choose 3 to form a Δ

$${}_8C_3 = \frac{8!}{5!\,3!} = \frac{8\cdot7\cdot6\cdot5!}{5!\,3!} = \frac{8\cdot7\cdot6}{3\cdot2}$$

$$= 8\cdot7 = 56$$

24. What is the value of

$$\cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\dots}}}$$

(*a*) 1 (*b*) $\frac{1}{2}$ (*c*) $1+\sqrt{2}$ (*d*) $-1\pm\sqrt{2}$ (*e*) $-1+\sqrt{2}$

Let $x = \cfrac{1}{2+\cfrac{1}{2+\cfrac{1}{2+\dots}}} \Rightarrow x = \frac{1}{2+x}$

$x(2+x)=1$

$x^2+2x-1=0$

$x = \frac{-2\pm\sqrt{4-4(1)(-1)}}{2} = \frac{-2\pm\sqrt{8}}{2} = -1\pm\sqrt{2}$

but $x>0 \Rightarrow x = -1+\sqrt{2}$

25. Paul and Judy play the exciting game "throw a coin six times". If the coin shows heads, Paul gets a point, if tails, Judy gets a point. After six throws, they compare their scores. How likely is it that the game will be a tie?

(*a*) $\frac{1}{2}$ (*b*) $\frac{5}{16}$ (*c*) $\frac{1}{4}$ (*d*) $\frac{7}{16}$ (*e*) $\frac{3}{16}$

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1
0H 1H 2H 3H 4H 5H 6H

2^6 possibilities w/ 6-coin throw

For a tie, there would be 3H and 3T.

$P(3H) = \frac{20}{2^6} = \frac{5}{2^4}$

$= \frac{5}{16}$

26. If $f(\sin(x)) = \sin(3x)$, then $f(\cos(30^o)) = ?$

(a) 0 (b) 1 (c) -1 (d) $\sqrt{\frac{3}{2}}$ (e) $\frac{1}{2}$

$\cos 30^\circ = \sin 60^\circ$

$\Rightarrow f(\cos(30^\circ)) = f(\sin(60^\circ))$

$= \sin(3(60^\circ))$

$= \sin 180^\circ = 0$

27. If the equation $\left(\frac{1}{4}\right)^x + \left(\frac{1}{2}\right)^{x-1} + b = 0$ has a positive solution, then the real number b is in what interval?

(a) $-\infty < b < 1$
(b) $-\infty < b < -2$
(c) $-\infty < b < 0$
(d) $-3 < b < 0$
(e) $-\infty < b < -3$

$\left[\left(\frac{1}{2}\right)^x\right]^2 + 2\left[\left(\frac{1}{2}\right)^x\right] + b = 0$ Like a quadratic eqn

$\left(\frac{1}{2}\right)^x = \frac{-2 \pm \sqrt{4-4b}}{2} = -1 \pm \sqrt{1-b}$ (only consider positive solution)

$\left(\frac{1}{2}\right)^x = -1 + \sqrt{1-b}$

$\ln\left(\frac{1}{2}\right)^x = \ln(\sqrt{1-b} - 1)$

$x = \frac{\ln(\sqrt{1-b} - 1)}{-\ln 2}$ $\Rightarrow$ We need $(\ln(\sqrt{1-b} - 1)) < 0$

So $x > 0$

+ we know we can only take ln of positive #s

$\Rightarrow 0 < \sqrt{1-b} - 1 < 0$

$1 < \sqrt{1-b} < 2$

$1 < 1-b < 4$

$0 < -b < 3$

$0 > b > -3$

$\Leftrightarrow -3 < b < 0$

28. If $f(x) = 3x^2 - x + 4$, $f(g(x)) = 3x^4 + 18x^3 + 50x^2 + 69x + 48$, then what is one of the sums of all the coefficients of $g(x)$?

(a) 8 (b) 1 (c) 3 (d) 7 (e) 0

g(x) must be quadratic polynomial

$\Rightarrow g(x) = ax^2 + bx + c$

$f(g(x)) = 3(ax^2+bx+c)^2 - (ax^2+bx+c) + 4$

$= (3a^2)x^4 + (6ab)x^3 + (6ac + 3b^2 - a)x^2 + (6bc - b)x + (3c^2 - c + 4) = 3x^4 + 18x^3 + 50x^2 + 69x + 48$

$\Rightarrow 3a^2 = 3 \iff a = \pm 1$ $6ab = 18$ $b = \frac{18}{6a} = \pm 3$ $6ac + 3b^2 - a = 50$

$a=1$ $b=3$ $c=4$ | $a=-1$ $b=-3$ $c=-11/3$

(all other coefficients equate w/ these answers)

a	1	-1
b	3	-3
c	4	-11/3

$\Rightarrow a+b+c = 1+3+4 = 8$

or $-1-3-\frac{11}{3} = \frac{-23}{3}$

29. Evaluate $\int_1^3 \frac{x^3+x^2+1}{x^2+x}\,dx$

(a) $4 + \ln\frac{2}{3}$

(b) $4 - \ln\frac{2}{3}$

(c) $\frac{9}{2} + \ln\frac{3}{4}$

(d) $\frac{9}{2} - \ln\frac{4}{3}$

(e) $\frac{9}{2} - \ln\frac{2}{3}$

① do long division

$x^2+x \overline{\smash{)}\, x^3+x^2+1}$ quotient $x + \frac{1}{x^2+x}$

$-(x^3+x^2)$

1

② partial fractions

$\frac{1}{x(x+1)} = \frac{A}{x} + \frac{B}{x+1}$

$1 = Ax + A + Bx$

$A = 1$ $A + B = 0$

$B = -1$

$\int_1^3 x + \frac{1}{x^2+x}\,dx = \frac{x^2}{2}\Big|_1^3 + \int_1^3 \frac{1}{x(x+1)}\,dx$

$= \left(\frac{9}{2} - \frac{1}{2}\right) + \int_1^3 \frac{1}{x(x+1)}\,dx$

$= 4 + \int_1^3 \frac{1}{x} - \frac{1}{x+1}\,dx$

$= 4 + (\ln|x| - \ln|x+1|)\Big|_1^3$

$= 4 + (\ln 3 - \ln 4) - (\ln 1 - \ln 2)$

$= 4 + \ln 3 - \ln 4 + \ln 2$

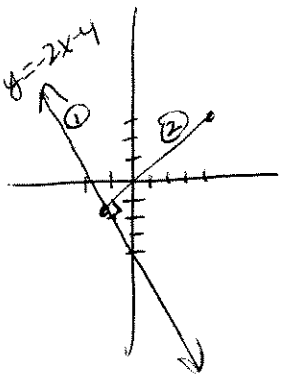
$= 4 + \ln\left(\frac{6}{4}\right) = 4 + \ln\left(\frac{3}{2}\right)$

or $4 - \ln\left(\frac{2}{3}\right)$

30. Find the perpendicular distance of the point $(4,3)$ from the line

line ① $$y = -2x - 4.$$

(*a*) $\sqrt{65}$ (*b*) 9 (*c*) $2\sqrt{5}$ (*d*) $3\sqrt{5}$ (*e*) 4



line ② ⊥ to ① $m = \frac{1}{2}$ thru $(4,3)$

$$y - 3 = \frac{1}{2}(x-4)$$

$$y = \frac{1}{2}x + 1$$

need intersectn pt between ① + ②

$$\frac{1}{2}x + 1 = -2x - 4$$

$$x = -2$$

$$\Rightarrow y = 0$$

distance from $(-2,0)$ to $(4,3)$

$$d = \sqrt{(0-3)^2 + (-2-4)^2} = \sqrt{9+36} = \sqrt{45} = 3\sqrt{5}$$