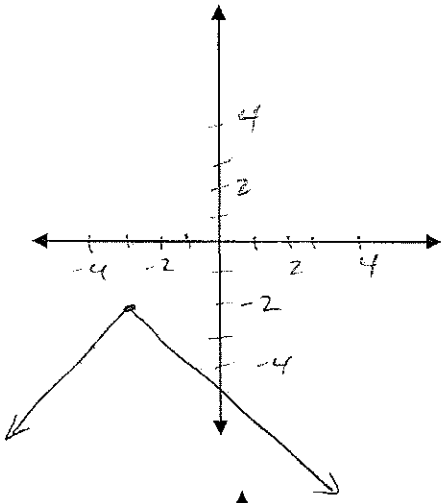
FUNCTIONS

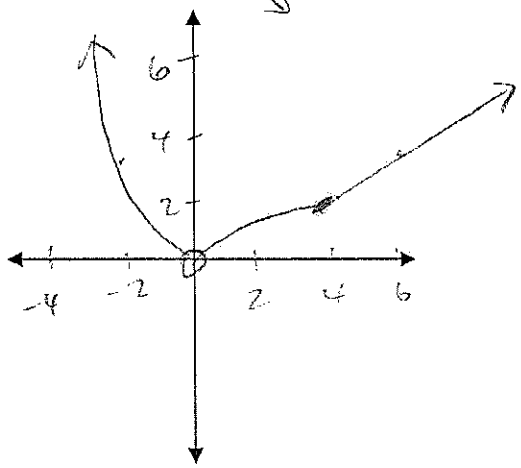
1. Given $f(x) = -|x + 3| - 2$



   a. Sketch f(x)
   b. Domain: $(-\infty, \infty)$
   c. Range: $(-\infty, -2]$
   d. f(3) = -8
   e. f(x+5) = $-|x+8|-2$
   f. If f(x) = -3 then x = $\{-2, -4\}$

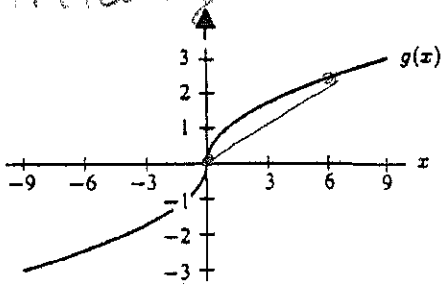
2. a. Graph the piece-wise function:

$$g(x) = \begin{cases} \frac{x}{2} & \text{if } x \geq 4 \\ \sqrt{x} & \text{if } 0 < x < 4 \\ x^2 & \text{if } x < 0 \end{cases}$$



   b. g(-3) = 9
   c. g(1) = 1
   d. g(0) = DNE
   e. Is g(x) a continuous function? How do you know? No, domain does not include zero

3. Given the graph of g(x) on the right,



   a. Estimate $\frac{g(6) - g(0)}{6 - 0}$.

$\frac{2.5-0}{6} = \frac{5}{12}$

   b. The ratio in part (a) is the slope of a line segment joining two points on the graph. Sketch this line segment.

4. The rate at which water is entering a tank (t > 0) is represented by the given graph. A negative rate means that water is leaving the tank. State the interval(s) on which each of the following holds true:

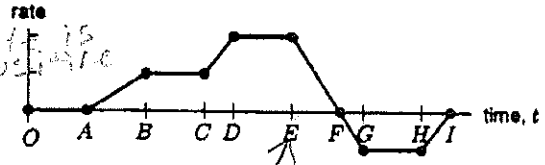
intervals, not solution set

a. The volume of water is constant. (0, A) rate = 0

b. The volume of water is decreasing. (F, I) rate is negative

c. The volume of water is increasing. (A, F) rate is positive

d. The volume of water is increasing fastest. (D, E) rate is greatest



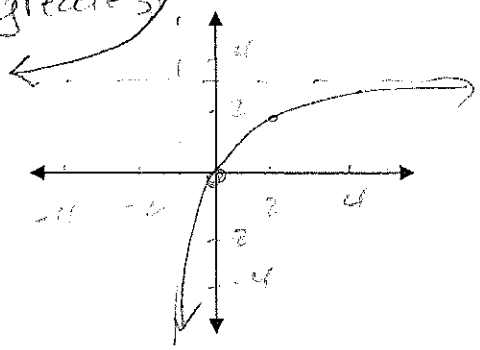
5. Given $Q(x)=\frac{3x}{x+1}$:

a. Where is this function discontinuous? $x=-1$

b. State the equation of the vertical asymptote x = -1

c. State the equation of the horizontal asymptote y = 3

d. Sketch the graph.



e. Write the equation of the inverse of Q(x). (Switch the x & y and then rewrite as y =)

$x=\frac{3y}{y+1}$

$xy+x=3y$

$y(x-3)=-x$

$y=\frac{-x}{x-3}$

$Q(x)=\frac{x}{3-x}$

6. Use these functions to evaluate: $f(x)=x+1$ $g(x)=x^2+2x-3$ $h(x)=2x-5$

a. $f(3)=$ 4

b. $g(5)=$ 32

c. $h(\frac{1}{2})=$ -4

d. $g(-2)=$ -3

e. $f(x)+h(x)=$ $3x-4$

f. $g(x)-h(x)=$ x^2+2

g. $f(h(1))=$ -2

h. $h(g(-3))=$ -5

i. $h(f(x))=$ $2x-3$

j. $g(f(x))=$ x^2+4x

TRIGONOMETRY

What you need to know:

- Trig functions and inverse trig functions for all special angles (unit circle)
- Fundamental trig identities (reciprocal, quotient, Pythagorean)
- Graphs of sine, cosine, tangent
- Domain and range of sine, cosine, tangent
- How to solve trig equations

1. Evaluate without use of a calculator.

(a) $\tan(\frac{\pi}{6})$ $\frac{\sqrt{3}}{3}$

(b) $\cos(\frac{\pi}{3})$ $\frac{1}{2}$

(c) $\sin(\pi)$ 0

(d) $\csc(\frac{\pi}{2})$ 1

(e) $\sin(\frac{\pi}{2})$ 1

(f) $\sin(\frac{3\pi}{4})$ $\frac{\sqrt{2}}{2}$

(g) $\cos(\pi)$ -1

(h) $\tan(\frac{\pi}{2})$ undefined

(i) $\cos(\frac{7\pi}{6})$ $-\frac{\sqrt{3}}{2}$

(j) $\tan(\frac{7\pi}{4})$ -1

2. Find the exact values without use of a calculator.

(a) $\sin^{-1}(\frac{\sqrt{3}}{2})$ $\frac{\pi}{3}$

(b) $\cos^{-1}(\frac{1}{2})$ $\frac{\pi}{3}$

(c) $\arcsin(-\frac{\sqrt{2}}{2})$ $-\frac{\pi}{4}$

(d) $\arctan(-\sqrt{3})$ $-\frac{\pi}{3}$ (not $\frac{5\pi}{3}$)

(e) $\sec^{-1}(-2)$ $\frac{2\pi}{3}$

(f) $\sin(\cos^{-1}0.6) = .8$

(use Pythagorean Theorem)

EQUATION OF A LINE

Write an equation of the line described in both slope intercept form and point slope form.

1. The line through (1, 4) and (3, 6)

$y-4=1(x-1)$ or $y-6=1(x-3)$

$y=x+3$

2. The line through (5, -2) and (-5, 4)

$y+2=-\frac{3}{5}(x-5)$ or $y-4=-\frac{3}{5}(x+5)$

$y=-\frac{3}{5}x+1$

3. The line through (2, 1) with slope 4

$y-1=4(x-2)$

$y=4x-7$

4. The line with slope $\frac{7}{2}$ and passing through (-2, -5)

$y+5=\frac{7}{2}(x+2)$

$y=\frac{7}{2}x+2$

5. The line with slope 8 and y-intercept 9

$y=8x+9$

$y-9=8(x-0)$

6. The line with slope $-\frac{3}{8}$ passing through (0, 5)

$y=-\frac{3}{8}x+5$

$y-5=-\frac{3}{8}(x-0)$

7. The line through (-2, -8) and parallel to the line y = 5x - 3

$y+8=5(x+2)$

$y=5x+2$

8. The line perpendicular to $y=\frac{4}{5}x-9$ and passing through (8, -13)

$y+13=-\frac{5}{4}(x-8)$

$y=-\frac{5}{4}x-3$

EXPONENTS

SIMPLIFY COMPLETELY:

1. $2(x^4y^3)^0$

2

2. $\frac{15x^2}{5\sqrt{x}}$

$3x^{3/2}$

$3x\sqrt{x}$

3. $\frac{3c^2d^3}{(3cd^{-2})^2}$

$\frac{d^7}{3}$

4. $\frac{\frac{2}{x^2}}{\frac{10}{x^5}}$

$\frac{x^3}{5}$

5. $(32)^{-2/5}$

$\frac{1}{4}$

6. $\sqrt{x} * \sqrt[3]{x} * \sqrt[4]{x}$

$x^{\frac{13}{12}}$ or $x\sqrt[12]{x}$

7. $\frac{x^2-x+7}{x}$

$x - 1 + \frac{7}{x}$

8. $\frac{x^3-x+1}{\sqrt{x}}$

$x^{5/2} - x^{1/2} + x^{-1/2}$

9. $\frac{\frac{1}{x+h}-\frac{1}{x}}{3h}$

$\frac{-1}{3x(x+h)}$

10. $\frac{\frac{a}{a+1}+\frac{1}{a}}{\frac{1}{a}+\frac{1}{a+1}}$

$\frac{a^2+a+1}{2a+1}$

11. $\ln 1$

0

12. $\ln e^7$

7

13. $\ln e$

1

14. e^0

1

15. $e^{\ln x}$

x

LOGARITHMS

Solve for x.

1. $\log_2 x = 3$

$x = 8$

2. $\log_{1/2} x = 3$

$x = \frac{1}{8}$

3. $\log_3 81 = x$

$x = 4$

You must be able to do these without a calculator

4. $\log_3(-9) = x$

Undefined

5. $\log_x 16 = -4$

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

6. $\log_x\left(\frac{1}{25}\right) = \frac{1}{2}$

$x = \frac{1}{625}$

7. $2^x = 3$

$x = \frac{\ln 3}{\ln 2}$

$x \approx 1.585$

8. $2.43 \cdot 10^x = 1.84$

$x \approx -.121$

9. $\ln(x+5) = -\ln(x-1) - \ln(x+1)$

$x \approx 1.079$

10. $3^{x+4} = 101$

$x \approx .201$

11. $4e^{x+2} = 32$

$x \approx .079$

12. $1.1 + \ln x^2 = 6$

$x \approx \pm 11.588$

SOLVING EQUATIONS

Solve for x.

1. $4(x+3)-3=2(4-3x)-4$

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

2. $15+x-2x^2=0$

$x=3$

$x=-\frac{5}{2}$

3. $5x^4-12x^3=0$

$x=0$

$x=2.4$

4. $\frac{1}{x-2}=3$

$x=\frac{7}{3}$

5. $4t^3-12t^2+8t-24=0$

$x=3$

6. $\frac{4}{x-3}-\frac{4}{x}=1$

$x=-2.275$

$x=5.275$

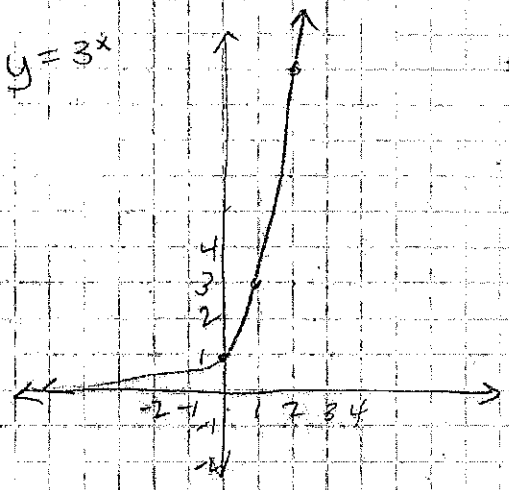
7. $\sqrt{x-2}-8=0$

$x=66$

8. $(x+2)^{3/4}=27$

$x=79$

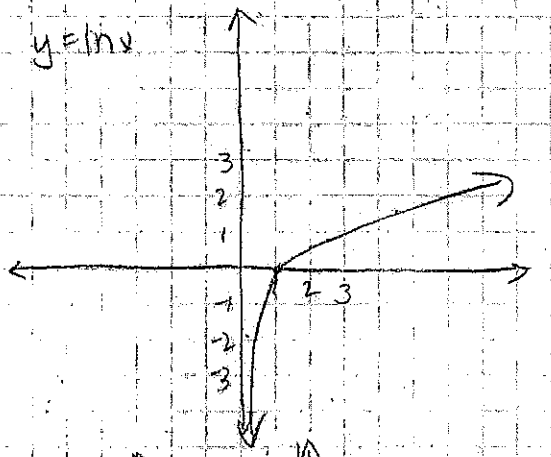
1. $y = 3^x$



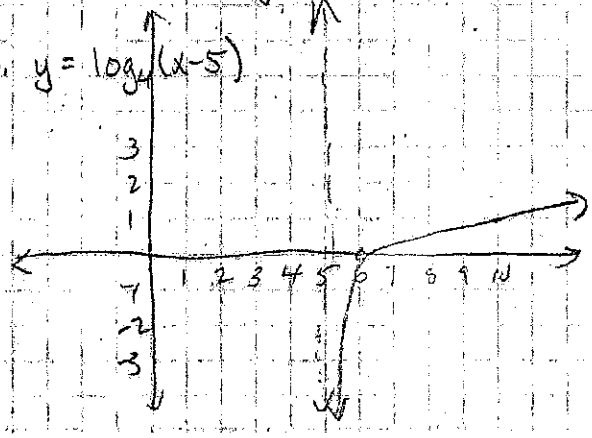
For each graph, you should identify any x intercepts, y intercepts, intervals of increasing/decreasing, end behavior, maxima, domain, range, asymptotes.

Be sure to scale each graph!

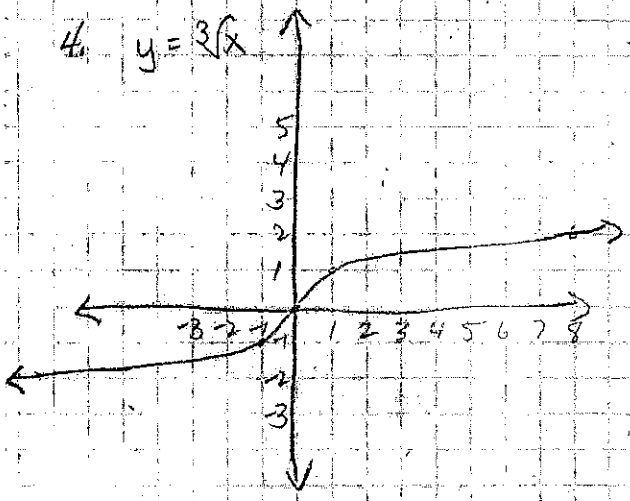
2. $y = \ln x$



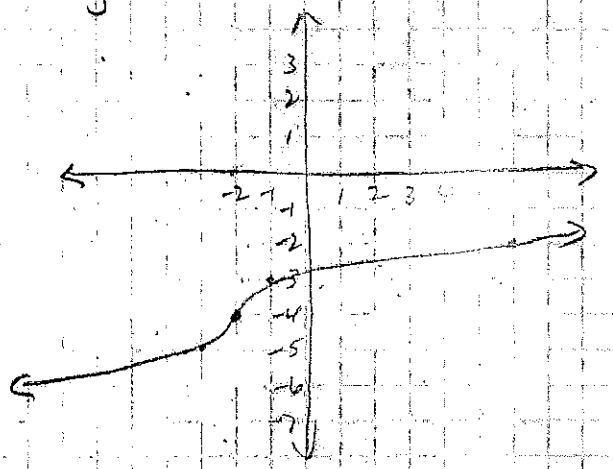
3. $y = \log_4(x-5)$



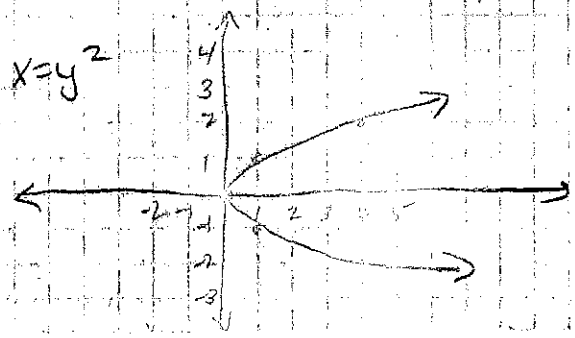
4. $y = \sqrt[3]{x}$



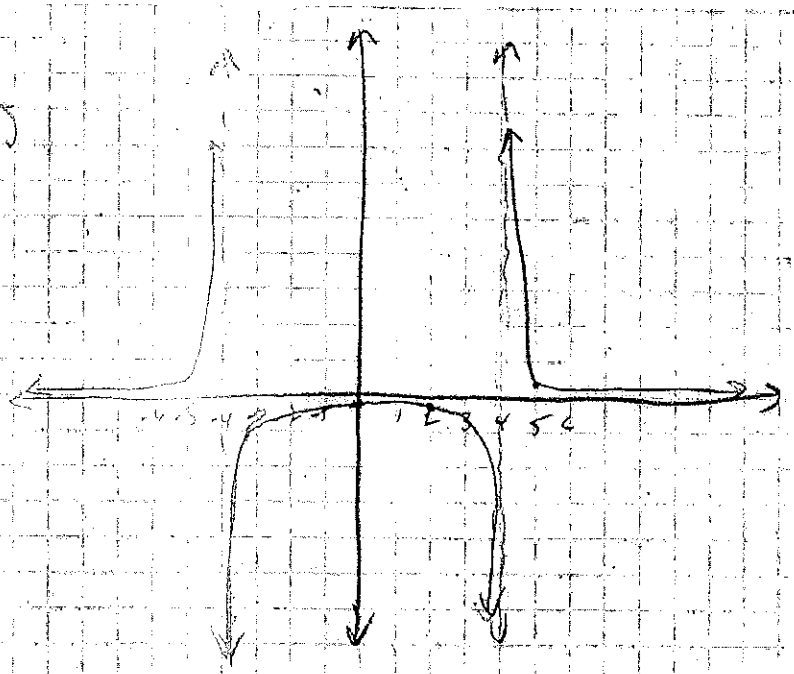
5. $y = \sqrt[3]{x+2} - 4$



6. $x = y^2$



7. $y = \frac{3x-2}{(x^2-16)(x-1)}$



8. $y = x^4 - 4x^3 - 3x^2 + 6x + 2$