MATH 255A — HOMEWORK PROBLEMS

SECTION 1.1

#16. Find domain; compute the values:

$$f(x) = (2x-1)^{-\frac{3}{2}}; \quad f(1);\ f(\tfrac{1}{2});\ f(0)$$

$$(2x-1)^{-\frac{3}{2}} = \frac{1}{\left(\sqrt{2x-1}\right)^3}; \text{ defined when}$$

$2x-1>0$

$2x>1$

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

Domain: $(\frac{1}{2}, \infty)$

values: $f(1) = (1)^{-\frac{3}{2}} = 1$

$f(\frac{1}{2}) = 0^{-\frac{3}{2}}$ undefined

$f(0) = (-1)^{-\frac{3}{2}}$ undefined.

#18.

$$f(x) = \begin{cases} 3 & x<-1 \\ x+1 & -1\le x\le 5 \\ \sqrt{x} & x>5 \end{cases}; \quad f(-6);\ f(5);\ f(16)$$

$-6<-1 \Rightarrow f(-6) = 3$

$-1\le 5\le 5 \Rightarrow f(5) = 5+1 = 6$

$16>5 \Rightarrow f(16) = \sqrt{16} = 4$

Domain: $\mathbb{R}$ (combination of the three cases.)

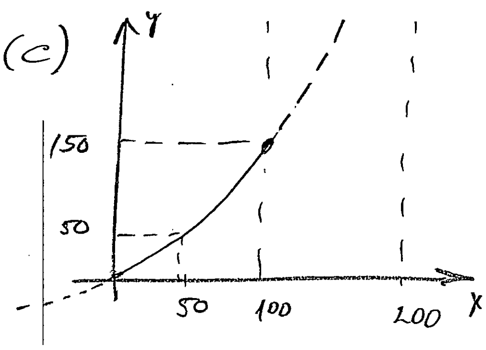
#44.

$$f(x) = \frac{150x}{200-x}$$

(a) Domain: $x \neq 200$: $(-\infty, 200) \cup (200, \infty)$.

(b) $0 \le x \le 100$

(c)



(d) $f(50) = 50$ [\$million]

$f(100) - f(50) =$

$= 150 - 50 = 100$ [\$ million]

The cost for the first 50% is half of the cost for the second 50%

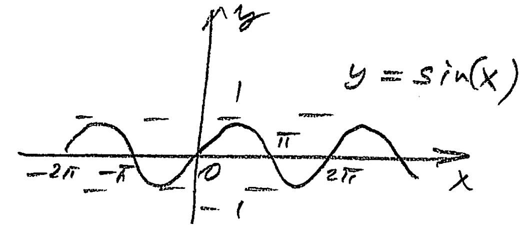
HOMEWORK PROBLEMS
SECTION 1.2

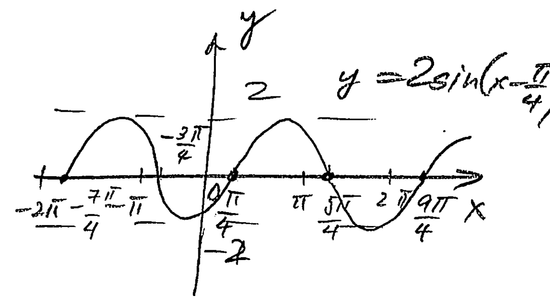
#32. $y = 2\sin\left(x - \frac{\pi}{4}\right)$

period: 2π (same as $\sin(x)$)

Amplitude: 2

Phase shift: $\frac{\pi}{4}$



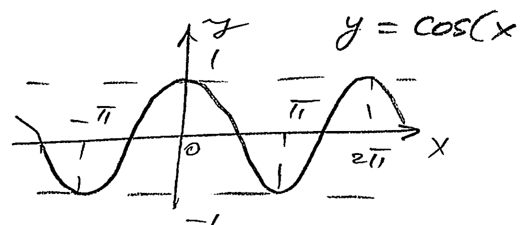


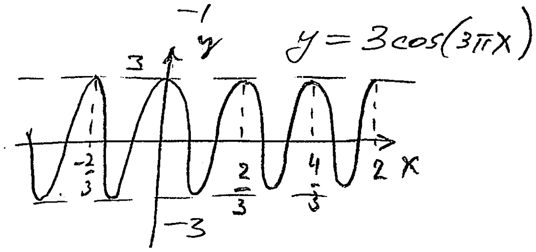
#34. $y = 3\cos(3\pi x)$

period: $\frac{2\pi}{3\pi} = \frac{2}{3}$

Amplitude: 3

Phase shift: 0



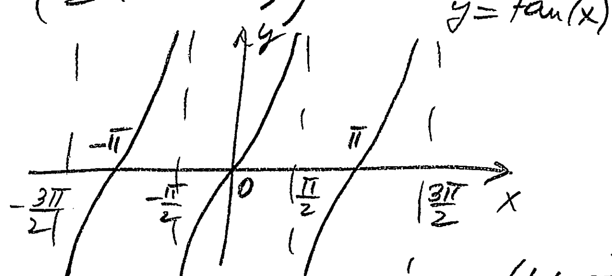


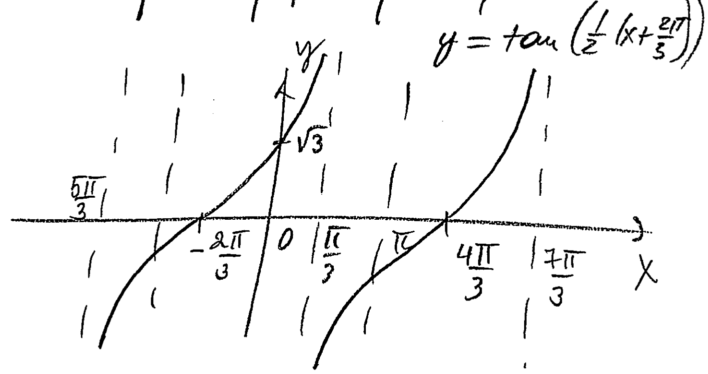
#36. $y = \tan\left(\frac{x}{2} + \frac{\pi}{3}\right) = \tan\left(\frac{1}{2}\left(x + \frac{2\pi}{3}\right)\right)$

period: $\frac{\pi}{1/2} = 2\pi$

Amplitude: none

Phase shift: $-\frac{2\pi}{3}$





MATH 255A HOMEWORK PROBLEMS

SECTION 1.3

#4. $y = \dfrac{2x+15}{5x} = \dfrac{2}{5} + 3x^{-1}$

not a power function (combination of two different exponents.)

#8. $y = \dfrac{\sqrt{36x}}{6x^5} = \dfrac{6x^{\frac{1}{2}}}{6x^5} = x^{\frac{1}{2}-5} = x^{\frac{9}{2}}$

Power function; $a = 1$, $b = \frac{9}{2}$.

#12. If $y \propto 6x$, $x \propto t$ then

$y \propto x \propto t \Rightarrow y \propto t \Rightarrow t \propto y$

$\dfrac{y_2}{y_1} = \dfrac{6 \cdot 10^4}{2 \cdot 10^2} = 3 \cdot 10^2$; $\dfrac{t_2}{t_1} = \dfrac{cy_2}{cy_1} = \dfrac{y_2}{y_1}$

$= 3 \cdot 10^2$

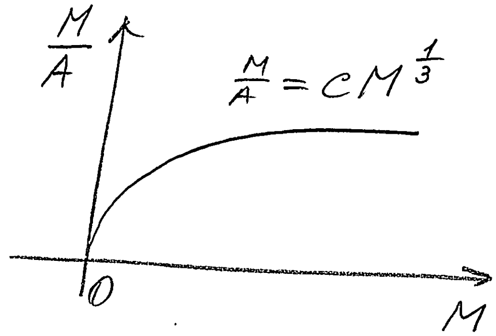
t_2 increases compared to t_1 by a factor 300 ($= 3 \cdot 10^2$)

#43. (a) $A \propto S \propto L^2$ $\qquad$ $M \propto V \propto L^3$

Air resistance $\qquad$ mass

Then $\dfrac{M}{A} \propto \dfrac{L^3}{L} \propto L \propto M^{\frac{1}{3}} \Rightarrow b = \frac{1}{3}$.

(b)



As the mass M, the effect of gravity force becomes stronger relative to the effect of air resistance

$\left(\dfrac{M}{A} = \dfrac{\text{"gravity"}}{\text{"air resistance"}} \right)$