G81 FINAL, FALL, 2011

① (a) $|2x-5|=3$

10 pts

$2x-5=\pm 3$

$2x=5\pm 3$

$x=\dfrac{5\pm 3}{2}$ $\to \dfrac{8}{2}=4$, $\dfrac{2}{2}=1$

$\boxed{x \in \{1,4\}}$

(b) $|2x-5|>3$

10 pts

$2x-5>3$ OR $2x-5<-3$

$2x>8$ $\qquad$ $2x<2$

$\{x \mid x>4 \text{ OR } x<1\} = \boxed{(-\infty,1)\cup(4,\infty)}$

(c) $|2x-5|<3$

10 pts

$-3<2x-5<3$

$2<2x<8$

$\{x \mid 1<x<4\} = \boxed{(1,4)}$

② $2x-5 \le 3x+2$

10 pts

$-x \le 7$

$\{x \mid x \ge -7\} = \boxed{[-7,\infty)}$

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3

(b) $x^2+4x-12=0$

$x^2+4x+2^2=12+4$

10pts

$(x+2)^2=16$

$x+2=\pm 4$

$x=-2\pm 4 \to -2+4=2$, $\ -2-4=-6$

$\boxed{x\in\{-6,2\}}$

(a) $x^2+4x-12=(x+6)(x-2)=0 \longrightarrow \boxed{x\in\{-6,2\}}$

10pts

(c) $a=1,\ b=4,\ c=-12$

10pts

$b^2-4ac=4^2-4(1)(-12)=16+48=64$

$x=\dfrac{-4\pm\sqrt{64}}{2(1)}=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}=\dfrac{-4\pm 8}{2} \to \dfrac{4}{2}=2,\ \dfrac{-12}{2}=-6$

$\boxed{x\in\{-6,2\}}$

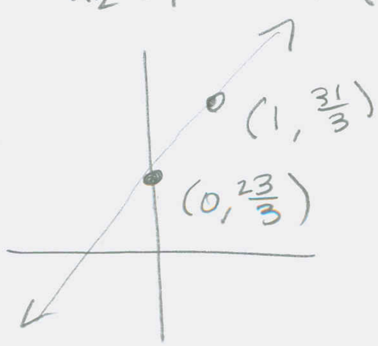
4 (a) $(x_1,y_1)=(-4,-3),\ (x_2,y_2)=(-1,5) \longrightarrow$

$m=\dfrac{y_2-y_1}{x_2-x_1}=\dfrac{5-(-3)}{-1-(-4)}=\dfrac{8}{3}$ $\quad \boxed{y=\dfrac{8}{3}(x-(-4))-3}$ 5pts

$=m(x-x_1)+y_1$

$=\dfrac{8}{3}x+\dfrac{32}{3}-\dfrac{9}{3}$

$=\boxed{\dfrac{8}{3}x+\dfrac{23}{3}=y}$



is one 2nd pt. Another would be up 8, right 3 from $(0,\frac{23}{3})$

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(4) (b) $m = \frac{8}{3} \Longrightarrow y = \frac{8}{3}(x+4)+10$ is

parallel to line in (a) & passes thru $(-4,10)$

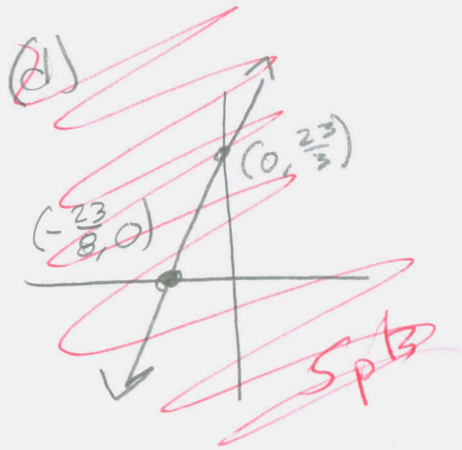
5pts

Re-write: $\frac{8}{3}x + \frac{32}{3} + \frac{30}{3} = \boxed{\frac{8}{3}x + \frac{62}{3} = y}$

(c) perpendicular to (a) & goes thru $(-4,10)$:

$$y = -\frac{3}{8}(x+4)+10$$
$$= -\frac{3}{8}x - \frac{12}{8} + 10$$
$$= -\frac{3}{8}x - \frac{3}{2} + \frac{20}{2}$$
$$\boxed{y = -\frac{3}{8}x + \frac{17}{2}}$$

5pts



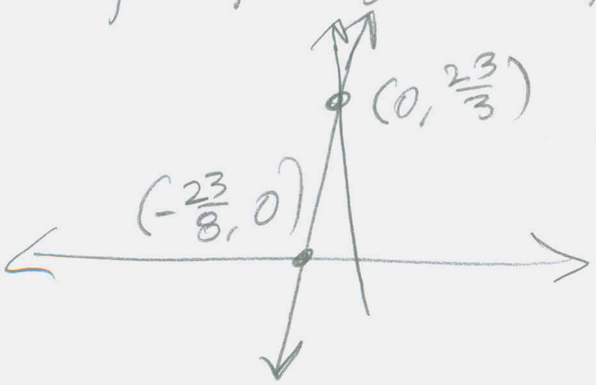
$\frac{8}{3}x = -\frac{23}{3}$

$x = -\frac{23}{8}$

(d) $y = \frac{8}{3}x + \frac{23}{3} \overset{\text{SET}}{=} 0 \longrightarrow \frac{8}{3}x = -\frac{23}{3}$

$y(0) = \frac{23}{3} \rightsquigarrow (0, \frac{23}{3})$ is y-int $\quad x = \frac{3}{8}(-\frac{23}{3}) = -\frac{23}{8}$

$(-\frac{23}{8}, 0)$



5pts

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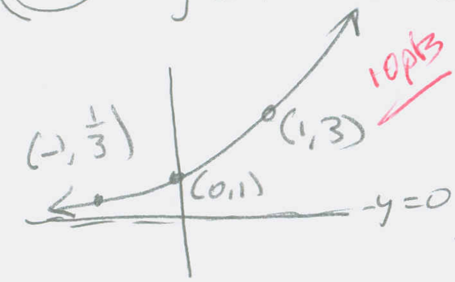
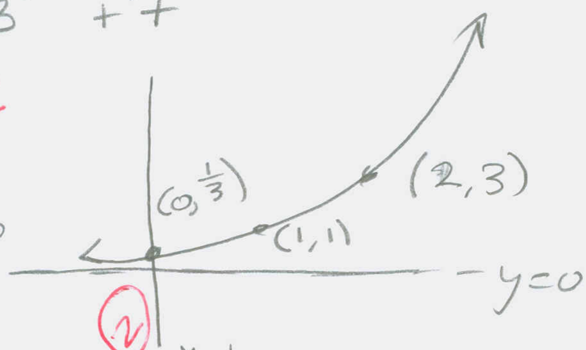
5 $g(x) = -2 \cdot 3^{x-1} + 7$

H.A.: 2 pts
Move: 8 pts
Show steps: 4 pts
x-int: 16 pts

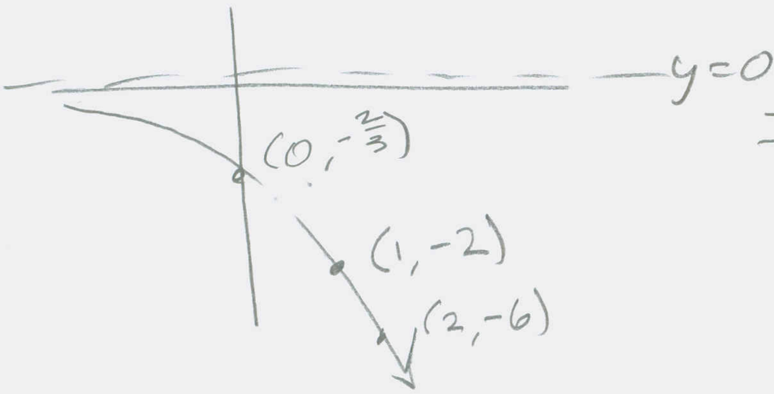


10 pts

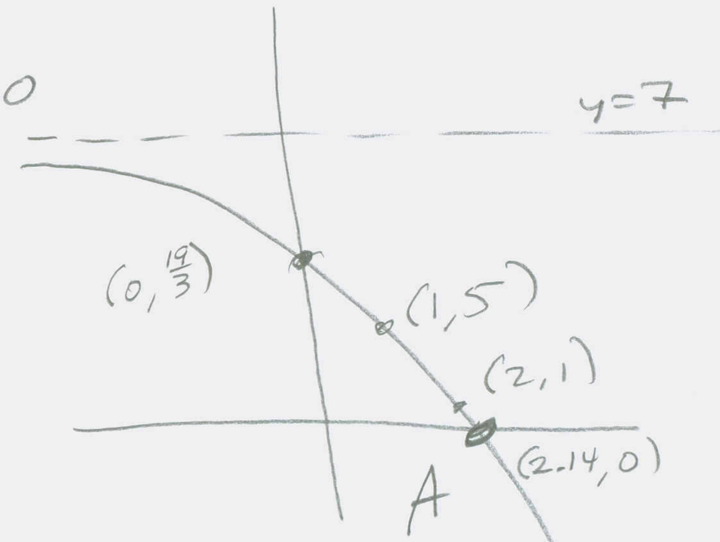
$f(x) = 3^x$ 1



2 $3^{x-1} = f(x-1)$



$-2 \cdot 3^{x-1} = -2f(x-1)$



$g(x) = -2 \cdot 3^{x-1} + 7$

$= -2f(x-1) + 7$

$A = (1 + \log_3(\frac{7}{2}), 0)$

$\approx (2.140313996, 0)$

$-2 \cdot 3^{x-1} + 7 = 0$

$-2 \cdot 3^{x-1} = -7$

$3^{x-1} = \frac{7}{2}$

$x - 1 = \log_3(\frac{7}{2})$

$x = 1 + \log_3(\frac{7}{2})$

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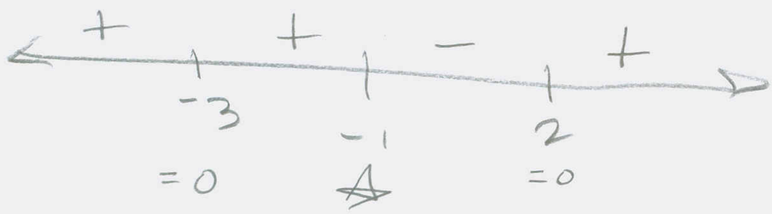
(6) $$\frac{(x-2)(x+3)^2}{(x+1)^3} \geq 0 \qquad x=-3 \text{ touch } (m=2)$$



10 pts

$$\boxed{x \in (-\infty,-1] \cup [2,\infty)}$$

(7) Domain of $\log_5\left(\frac{(x-2)(x+3)^2}{(x+1)^3}\right)$ Needs

$$\frac{(x-2)(x+3)^2}{(x+1)^3} > 0 \Longrightarrow$$

10 pts

$$\boxed{x \in (-\infty,-3) \cup (-3,-1) \cup (2,\infty)}$$

(8) (a) $$\sum_{k=1}^{7} (2)\left(\frac{3}{2}\right)^{k-1} = \frac{2\left(1-\left(\frac{3}{2}\right)^7\right)}{1-\frac{3}{2}} = \frac{2\left(1-\frac{2187}{128}\right)}{-\frac{1}{2}}$$

$$= \frac{2\left(\frac{-2059}{128}\right)}{-\frac{1}{2}} = 4\left(\frac{2059}{128}\right) = \boxed{\frac{2059}{32} = 64.34375}$$

5 pts

(b) $$\sum_{k=1}^{\infty} 5\left(\frac{2}{3}\right)^{k-1} = \frac{5}{1-\frac{2}{3}} = \frac{5}{\frac{1}{3}} = \boxed{15}$$

5 pts

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(9) $(x-2y)^4$

$$\begin{array}{ccccccccc} & & & & 1 & & & & \\ & & & 1 & & 1 & & & \\ & & 1 & & 2 & & 1 & & \\ & 1 & & 3 & & 3 & & 1 & \\ 1 & & 4 & & 6 & & 4 & & 1 \end{array}$$

$= x^4 + 4(x^3)(-2y) + 6(x)^2(-2y)^2 + 4(x)(-2y)^3 + (-2y)^4$

$= x^4 - 8x^3y + 24x^2y^2 - 32xy^3 + 16y^4$

10pts

(10)

$$\begin{array}{r|rrrrr} 2 & 1 & -3 & -10 & 4 & -10 \\ & & 2 & -2 & -24 & -40 \\ \hline & 1 & -1 & -12 & -20 & \boxed{-50 = f(2)} \end{array}$$

10pts

(11) $(x-1+2i)(x-1-2i) = x^2 - x - 2ix$

$-x + 1 + 2i$

$+2ix - 2i - 4i^2$

$= x^2 - 2x + 1 + 4 = \boxed{x^2 - 2x + 5}$

10pts

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

10pts

(13) $A = P(1+i)^n \underset{=}{\text{SET}} R\left[\frac{(1+i)^n - 1}{i}\right]$ & Solve for R

$$R = \frac{Pi}{1-(1+i)^{-n}} = \frac{10000\left(\frac{.11}{12}\right)}{1-\left(1+\frac{.11}{12}\right)^{-(3)(12)}}$$

$\approx$ $\approx \boxed{\$327.39}$

10pts