# ASSIGNMENT #2
# 943-DW
# APPLIED MATH FOR ELECTRONICS
# NOVEMBER 2ND 2012
# SOLUTIONS

## SECTION 3.1

#14 $f(x) = 5x - 9$

$f(2) = 5(2) - 9$
$= \boxed{1}$

$f(-2) = 5(-2) - 9$
$= \boxed{-19}$

#17 $\phi(x) = \dfrac{6 - x^2}{2x}$

$\phi(2\pi) = \dfrac{6 - (2\pi)^2}{2(2\pi)}$
$= \boxed{\dfrac{6 - 4\pi^2}{4\pi}}$

$\phi(-2) = \dfrac{6 - (-2)^2}{2(-2)}$
$= \dfrac{2}{-4} = \boxed{-\frac{1}{2}}$

#18 $H(q) = \frac{8}{q} + 2\sqrt{q}$

$H(4) = \frac{8}{4} + 2\sqrt{4}$
$= 2 + 4 = \boxed{6}$

$H(0.16) = \frac{8}{0.16} + 2\sqrt{0.16}$
$= \boxed{50.8}$

#22 $T(t) = 5t + 7$

$T(-2t) = 5(-2t) + 7 = \boxed{-10t + 7}$

$T(t-1) = 5(t-1) + 7$
$= 5t - 5 + 7$
$= \boxed{5t + 2}$

#23 $f(x) = 2x+4$

$f(3x) - 3f(x)$

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

$= 6x+4 - (6x+12)$

$= \boxed{-8}$

#24 $f(x) = 2x^2+1$

$f(x+2) - [f(x)+2]$

$= [2(x+2)^2+1] - [2x^2+1+2]$

$= [2(x^2+4x+4)+1] - [2x^2+3]$

$= [2x^2+8x+9] - [2x^2+3]$

$= \boxed{8x+6}$

## SECTION 3.2

#6 $g(u) = 3-u^2$

DOMAIN $\boxed{\mathbb{R}}$

RANGE:

VERTEX $x = 0$

$y = 3$

CONCAVE DOWN $\cap$

SO RANGE IS

$\boxed{(-\infty, +3]}$

#8 $F(r) = \sqrt{r+4}$

DOMAIN $\boxed{[-4, \infty)}$

RANGE $\boxed{[0, \infty)}$

#10 $T(t) = 2t^4 + t^2 - 1$

DOMAIN $\mathbb{R}$

RANGE: $[-1, \infty)$

THE LOWEST VALUE IS $-1$ BECAUSE $2t^4$ & $t^2$ WILL ALWAYS BE POSITIVE (OR ZERO)

#12 $f(x) = \dfrac{-6}{\sqrt{2-x}}$

DOMAIN $(-\infty, 2)$

RANGE $(-\infty, 0)$

#18 $g(x) = \dfrac{\sqrt{x-2}}{x-3}$

DOMAIN: $x \geq 2, x \neq 3$

# 19 $F(2) = 2$, $F(3)$ DNE

# 20 $h(-8) = -16$, $h(-0.5) = 0.5$

# 21 $f(1) = 2$, $f(-0.25) = 0.75$

# 22 $g(0.2) = 5$, $g(0) = 0$

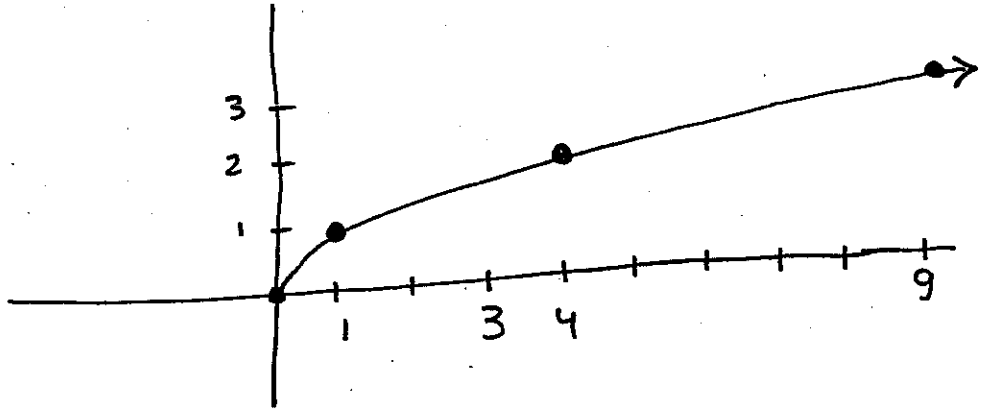
MARKING SCHEME
# 10 NOT MARKED
# 21-22 NOT MARKED
# 12 RANGE NOT MARKED

## SECTION 3.4

#33 GRAPH $y = \sqrt{x}$

DOMAIN $[0, \infty)$
RANGE $[0, \infty)$

| x | y |
|---|---|
| 0 | 0 |
| 1 | 1 |
| 4 | 2 |
| 9 | 3 |

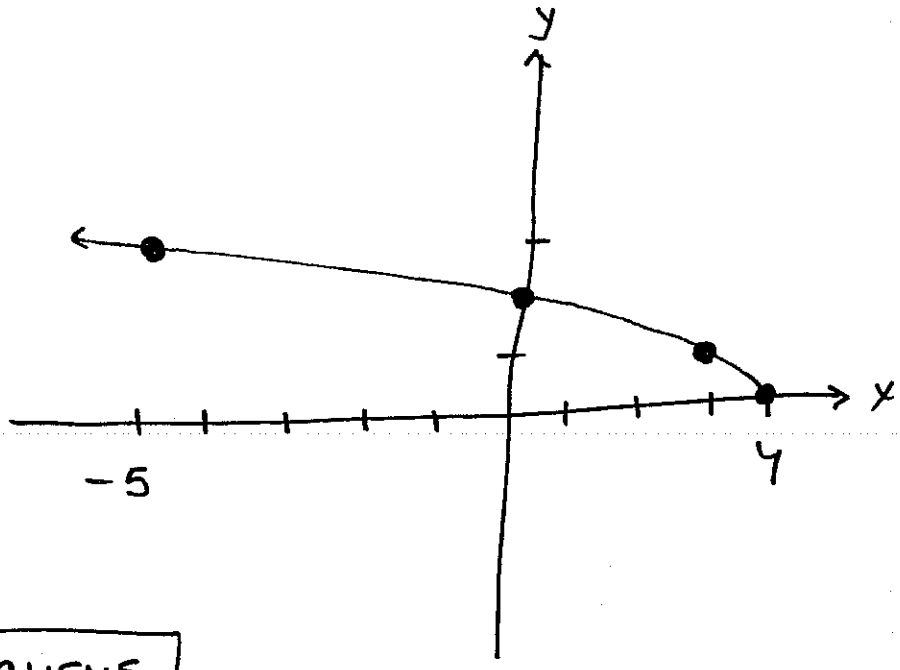


#34 $y = \sqrt{4-x}$

DOMAIN $(-\infty, 4]$

RANGE $[0, \infty)$

| x | y |
|---|---|
| 4 | 0 |
| 3 | 1 |
| 0 | 2 |
| -5 | 3 |




MARKING SCHEME
2 MARKS EACH

## CHAPTER 3 REVIEW

#11 $f(x) = 3-2x$;

$f(2x) - 2f(x)$

$= [3-2(2x)] - 2(3-2x)$

$= [3-4x] - [6-4x]$

$= \boxed{-3}$

#12 $f(x) = 1-x^2$;

$[f(x)]^2 - f(x^2)$

$= (1-x^2)^2 - (1-(x^2)^2)$

$= 1-2x^2+x^4-1+x^4$

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

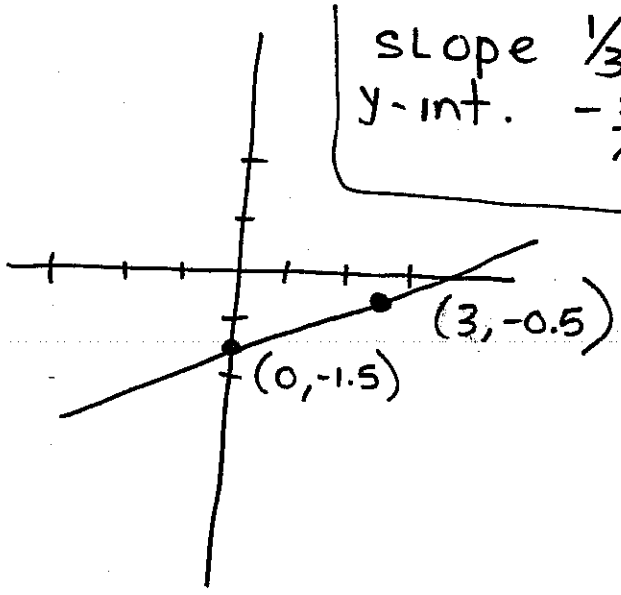
MARKING SCHEME
1 MARK EACH

# CHAPTER 5 REVIEW

# 10 $2y = \frac{2}{3}x - 3$

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

slope $\frac{1}{3}$
y-int. $-\frac{3}{2}$

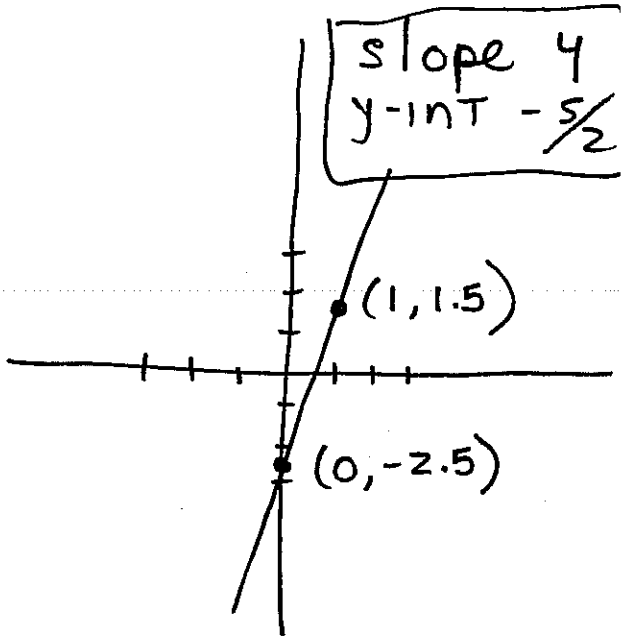



# 11 $8x - 2y = 5$

$2y = 8x - 5$

$y = 4x - \frac{5}{2}$

slope 4
y-int $-\frac{5}{2}$



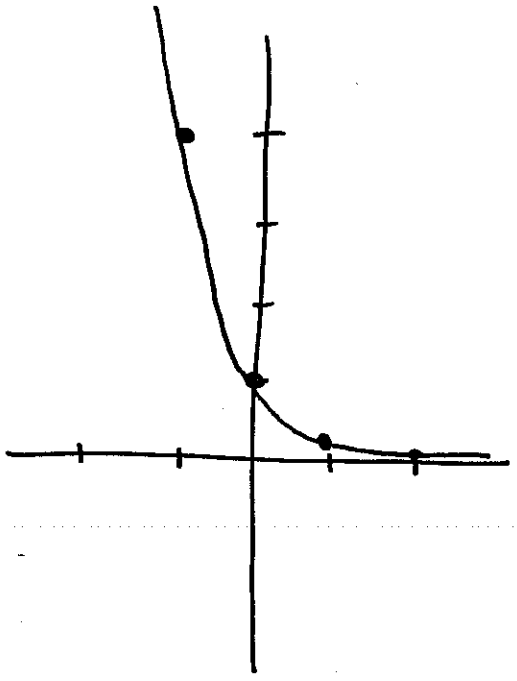

MARKING SCHEME

2 MARKS FOR #10

#11 UNMARKED

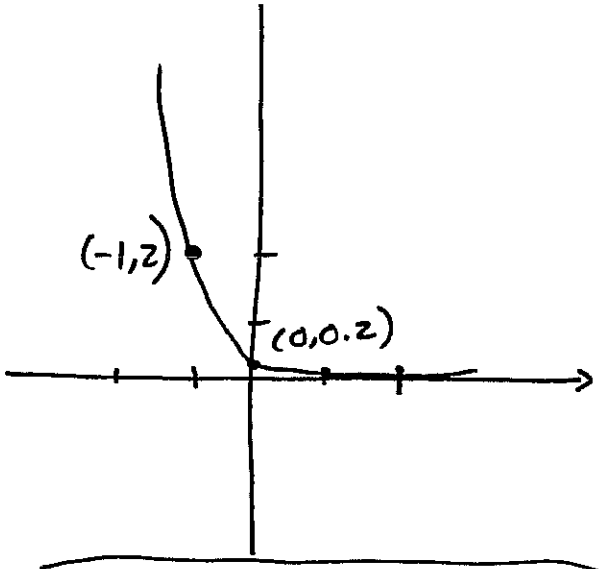
# SECTION 13.1

#14 $y = 0.25^x$



| x | y |
|---|---|
| -2 | 16 |
| -1 | 4 |
| 0 | 1 |
| 1 | 1/4 |
| 2 | 1/16 |

#15 $y = 0.2(10^{-x})$




| x | y |
|---|---|
| -2 | 20 |
| -1 | 2 |
| 0 | 0.2 |
| 1 | 0.02 |
| 2 | 0.002 |

MARKING SCHEME
2 MARKS #14
#15 UNMARKED

# SECTION 13.2

#32 $\log_{16}(1/4) = x$

$\boxed{x = -1/2}$

(b/c $16^{-1/2} = \frac{1}{\sqrt{16}} = 1/4$)

#34 $\log_8 (N+1) = 3$

$N+1 = 8^3$

$N = 8^3 - 1$

$\boxed{N = 511}$

#36 $\log_7 y = -2$

$\boxed{y = 7^{-2} = 1/49}$

#38 $\log_b 625 = 4$

$b^4 = 625$

$b = \sqrt[4]{625}$

$\boxed{b = 5}$

#40 $\log_b 4 = 2/3$

$b^{2/3} = 4$

$b = 4^{3/2}$

$= (\sqrt{4})^3$

$= 2^3 = 8$

$\boxed{b = 8}$

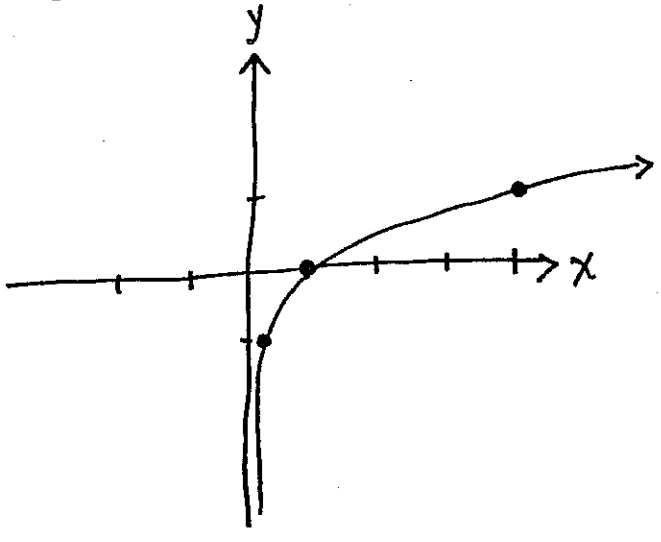
#46 $y = \log_4 x$

DOMAIN : $(0, \infty)$

ASYMPTOTE (VERTICAL) $x = 0$

$4^y = x$

| y | x |
|---|---|
| -1 | 1/4 |
| 0 | 1 |
| 1 | 4 |



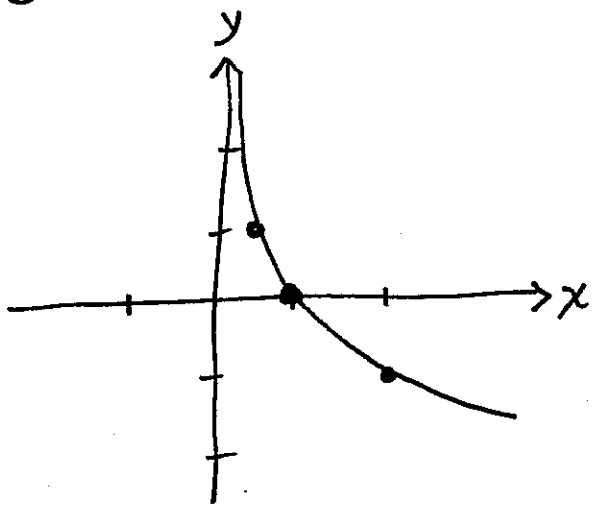
# 47 $y = \log_{0.5} x$

DOMAIN $(0, \infty)$

V. ASYM. $x = 0$

$0.5^y = x$

| y | x |
|---|---|
| -1 | 2 |
| 0 | 1 |
| 1 | ½ |




MARKING SCHEME

| | |
|---|---|
| #32-40 | 5 MARKS |
| # 46 | 2 MARKS |
| # 47 | UNMARKED |

## SECTION 13.3

#22 $\log_2 3 + \log_2 x$

$= \boxed{\log_2 3x}$

#24 $-\log_8 R + \log_8 V$

$= \boxed{\log_8 \left(\frac{V}{R}\right)}$

#26 $\log_4 3^3 + \log_4 9$

$= \log_4 (27 \cdot 9)$

$= \boxed{\log_4 (243)}$

#28 $\frac{1}{2} \log_b 9 - 2\log_b 5$

$= \log_b 9^{1/2} - \log_b 5^2$

$= \boxed{\log_b \left(\frac{3}{25}\right)}$

#46 $\log_b y = \log_b 6 - \log_b x$

$\log_b y = \log_b \frac{6}{x}$

$\boxed{y = 6/x}$

#48 $\log_3 Y = -2\log_3 (x+1) + \log_3 7$

$\log_3 Y = \log_3 (x+1)^{-2} + \log_3 7$

$\log_3 Y = \log_3 7 \cdot (x+1)^{-2}$

$\boxed{y = \frac{7}{(x+1)^2}}$

#50 $\log_b Y = 3\log_b \sqrt{x} + 2\log_b 10$

$\log_b y = \log_b (\sqrt{x})^3 + \log_b 10^2$

$\log_b y = \log_b 100\, x^{3/2}$

$\boxed{y = 100\, x^{3/2}}$

#52 $4\log_2 x - 3\log_2 y = \log_2 27$

$\log_2 x^4 - \log_2 y^3 = \log_2 27$

$\log_2 \frac{x^4}{y^3} = \log_2 27$

MARKING SCHEME
#46,48,50
(2 MARKS EACH)

$\frac{x^4}{y^3} = 27 \implies y^3 = \frac{x^4}{27}$

$\boxed{y = \sqrt[3]{\frac{x^4}{27}}}$

## SECTION 13.4

# 22 $\dfrac{895}{(73.4)^{86}} = y$

$$\log y = \log 894 - 86 \log 73.4$$
$$= -157.49852$$

$$y = 10^{-157.49852}$$
$$= 10^{-157} \cdot 10^{-0.4985}$$
$$= 0.317 \times 10^{-157}$$
$$= \boxed{3.17 \times 10^{-158}}$$

# 23 $y = \sqrt[10]{7.32}\,(2470)^{30}$

$$\log y = \frac{1}{10}\log(7.32) + 30 \log 2470$$
$$\log y = 101.867$$
$$y = 10^{101.867}$$
$$= 10^{0.867} \cdot 10^{101}$$
$$= \boxed{7.368 \times 10^{101}}$$

MARKING SCHEME
UNMARKED

# SECTION 13.6

#4 $3^x = \frac{1}{81}$

$\log_3 3^x = \log_3 \frac{1}{81}$

$x = \log_3 (1/81)$

$\boxed{x = -4}$

#8 $e^{-x} = 17.54$

$\ln e^{-x} = \ln 17.54$

$-x = \ln 17.54$

$\boxed{x \approx -2.86}$

#10 $5^{x-1} = 0.07$

$\log 5^{x-1} = \log 0.07$

$(x-1)\log 5 = \log 0.07$

$x - 1 = \frac{\log 0.07}{\log 5}$

$x = \frac{\log 0.07}{\log 5} + 1$

$\boxed{x \approx -0.65}$

#14 $(15.6)^{x+2} = 23^x$

$(x+2)\log 15.6 = x \log 23$

$x\log 15.6 + 2\log 15.6 = x \log 23$

$x(\log 15.6 - \log 23) = -2\log 15.6$

$x = \frac{-2\log 15.6}{\log 15.6 - \log 23}$

$\boxed{x \approx 14.15}$

#20 $2\log_2 3 - \log_2 x = \log_2 45$

$$\log_2 \frac{9}{x} = \log_2 45$$

$$\frac{9}{x} = 45$$

$$\boxed{x = 9/45 = 1/5}$$

#24 $\ln x - \ln(1/3) = 1$

$$\ln 3x = 1$$

$$3x = e^1$$

$$\boxed{x = e/3}$$

#25 $3\ln 2 + \ln(x-1) = \ln 24$

$$\ln 2^3(x-1) = \ln 24$$

$$2^3(x-1) = 24$$

$$x-1 = 24/8$$

$$\boxed{x = 4}$$

#28 $2\log_x 2 + \log_2 x = 3$

$\log_x 4 + \log_2 x = 3$

$\dfrac{\log_2 4}{\log_2 x} + \log_2 x = 3$

SAME DENOMINATOR

$\dfrac{2 + (\log_2 x)^2}{\log_2 x} = 3$

$2 + (\log_2 x)^2 = 3\log_2 x$

LET $A = \log_2 x$

THEN WE HAVE

$A^2 - 3A + 2 = 0$

$(A-1)(A-2) = 0$

$A = 1 \quad A = 2$

So $\log_2 x = 1$ or $\log_2 x = 2$

$\boxed{x = 2 \quad \text{or} \quad x = 4}$

MARKING SCHEME

# 4, 8, 10, 14, 20, 24, 25 1 MARK EACH

# 28 UNMARKED