Solutions For Calculus Study Guide

Topic 1

p7

8) (0,0) and (1,1)

$m = \frac{1-0}{1-0} = 1$

$b = 0$

$\boxed{y = x}$

9) (0,2) and (2,3)

$m = \frac{3-2}{2-0} = \frac{1}{2}$

$b = 2$

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

10) (-2,1) and (2,3)

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

$3 = \frac{1}{2} \cdot 2 + b$

$3 = 1 + b$

$2 = b$

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

11) $y = 5x - 3 \Rightarrow m = 5$

so $m_{\perp} = -\frac{1}{5}$ pt. (2,1)

$1 = -\frac{1}{5} \cdot 2 + b$

$\frac{5}{5} = -\frac{2}{5} + b$

$\frac{7}{5} = b$

$\boxed{y = -\frac{1}{5}x + \frac{7}{5}}$

12) $y + 4x = 7$

$y = -4x + 7$

Parallel: $m = -4$ pt: (1,5)

$5 = -4 \cdot 1 + b$

$9 = b$

$\boxed{y = -4x + 9}$

Perp: $m = \frac{1}{4}$ pt: (1,5)

$5 = \frac{1}{4} \cdot 1 + b$

$\frac{20}{4} - \frac{1}{4} = b$

$\frac{19}{4} = b$

$\boxed{y = \frac{1}{4}x + \frac{19}{4}}$

p15

18) (0,3) (2,12)

$y = a \cdot b^x$

$3 = a \cdot b^0 \Rightarrow 3 = a \cdot 1 \Rightarrow a = 3$

$12 = a \cdot b^2$

$12 = 3 \cdot b^2$

$4 = b^2$

$2 = b$

$\boxed{y = 3 \cdot 2^x}$

p15, CONTINUED

19) $(-1, 8)$ and $(1, 2)$

$8 = a \cdot b^{-1}$

$2 = a \cdot b^{1}$

$4 = b^{-2}$

$\frac{1}{4} = b^{2}$

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

$2 = a \cdot \frac{1}{2}^{1}$

$4 = a$

$\boxed{y = 4 \cdot \left(\frac{1}{2}\right)^{x}}$

20) $(1, 6)$ and $(2, 18)$

$6 = a \cdot b^{1}$

$18 = a \cdot b^{2}$

$3 = b$

$6 = a \cdot 3^{1}$

$2 = a$

$\boxed{y = 2 \cdot 3^{x}}$

TOPIC 2

p8

30) a) $(100, 32)$, $(180, 48)$

$m = \frac{48 - 32}{180 - 100} = \frac{16}{80} = 0.2$

$32 = 0.2 \cdot 100 + b$

$32 = 20 + b$

$12 = b$

$\boxed{C = 0.2w + 12}$

b) $m = 0.2$ $\boxed{\$0.2 \text{ per kg of waste}}$

c) vertical intercept = 12

$\boxed{\$12 \text{ flat fee (for 0 kg of waste)}}$

p8 CONTINUED

31) a) (1000, 90) and (1600, 105)

$$m = \frac{105-90}{1600-1000} = \frac{15}{600} = 0.025$$

$0.025 per cubic foot

b) $90 = .025 \cdot 1000 + b$

$90 = 25 + b$

$65 = b$

$C = 0.025f + 65$

c) $130 = .025f + 65$

$65 = .025f$

$2600 = f$

2600 ft^3 of water

p14

9) a) $P = 1000 + 50t$

b) $P = 1000(1.05)^t$

10) a) $Q = 30 - 2t$

b) $Q = 30(0.88)^t$

TOPIC 3

p27

2) $3^x = 11$

$\ln 3^x = \ln 11$

$x \ln 3 = \ln 11$

$x = \frac{\ln 11}{\ln 3} = 2.18$

$x \approx 2.18$

3) $17^x = 2$

$\ln 17^x = \ln 2$

$x \ln 17 = \ln 2$

$x = \frac{\ln 2}{\ln 17}$

$x \approx 0.24$

p27 CONTINUED

10) $7 = 5e^{0.2x}$

$1.4 = e^{0.2x}$

$\ln 1.4 = \ln e^{0.2x}$

$\ln 1.4 = 0.2x$

$x = \frac{\ln 1.4}{0.2}$

$\boxed{x \approx 1.68}$

11) $50 = 600e^{-0.4x}$

$.083 = e^{-0.4x}$

$\ln .083 = \ln e^{-0.4x}$

$\frac{\ln .083}{-0.4} = \frac{-0.4x}{-0.4}$

$\boxed{x \approx 6.22}$

TOPIC 4 p47

13) $f(x) = \begin{cases} kx & 0 \le x < 2 \\ 3x^2 & 2 \le x \end{cases}$

$2k = 3 \cdot 2^2$

$2k = 12$

$\boxed{k = 6}$

15) $f(x) = \begin{cases} \frac{5x^3 - 10x^2}{x-2} & x \neq 2 \\ k & x = 2 \end{cases}$

$\frac{5x^3 - 10x^2}{x-2} = \frac{5x^2(x-2)}{x-2} = 5x^2$

so there's an open hole at $(2, 5(2)^2) = (2, 20)$

$\boxed{k = 20}$ would fill that hole in to make graph continuous

---

TOPIC 5 p48

1) a) $D = [0, 7]$

b) $R = [-2, 5]$

c) $x = 5$ (x-int)

d) $(1, 7)$

e) up

f) $f(4) = 2$

g) no fails horizontal line test

TOPIC 6 p21

1) $g(x) = x^2 + 2x + 3$

a) $g(2+h) = (2+h)^2 + 2(2+h) + 3$

$= 4 + 4h + h^2 + 4 + 2h + 3$

$= \boxed{h^2 + 6h + 11}$

b) $g(2) = 2^2 + 2 \cdot 2 + 3 = 4 + 4 + 3 = \boxed{11}$

c) $g(2+h) - g(2) = h^2 + 6h + 11 - 11 = \boxed{h^2 + 6h}$

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

a) $f(t+1) = (t+1)^2 + 1 = t^2 + 2t + 1 + 1 = \boxed{t^2 + 2t + 2}$

b) $f(t^2+1) = (t^2+1)^2 + 1 = t^4 + 2t^2 + 1 + 1 = \boxed{t^4 + 2t^2 + 2}$

c) $f(2) = 2^2 + 1 = \boxed{5}$

d) $2f(t) = 2(t^2 + 1) = \boxed{2t^2 + 2}$

e) $[f(t)]^2 + 1 = (t^2+1)^2 + 1 = \boxed{t^4 + 2t^2 + 2}$

5) $m(z+1) - m(z)$

$(z+1)^2 - z^2$

$z^2 + 2z - 1 - z^2$

$\boxed{2z - 1}$

6) $m(z+h) - m(z)$

$(z+h)^2 - z^2$

$z^2 + 2zh + h^2 - z^2$

$\boxed{2zh + h^2}$

7) $m(z) - m(z-h)$

$z^2 - (z-h)^2$

$z^2 - (z^2 - 2zh + h^2)$

$\boxed{2zh - h^2}$

8) $m(z+h) - m(z-h)$

$(z+h)^2 - (z-h)^2$

$((z+h)+(z-h))((z+h)-(z-h))$

$2z \cdot 2h$

$\boxed{4zh}$

LAST ONE:

$$f(x) = 3x^2 - 4x + 5$$

$$\frac{f(-2+h) - f(-2)}{h} = \frac{\left(3(-2+h)^2 - 4(-2+h) + 5\right) - \left(3(-2)^2 - 4(-2) + 5\right)}{h}$$

$$= \frac{3(4 - 4h + h^2) + 8 - 4h + 5 - (12 + 8 + 5)}{h}$$

$$= \frac{12 - 12h + 3h^2 + 8 - 4h + 5 - 25}{h}$$

$$= \frac{3h^2 - 16h}{h}$$

$$= \frac{h(3h - 16)}{h}$$

$$\boxed{= 3h - 16}$$