

# Midterm Review #2

① Plan A:  $y = 1000 + 80(x-1)$  (arithmetic)

Plan B:  $y = 1000(1.06)^{x-1}$  (geometric)

a) 2<sup>nd</sup> month =  $1000(1.06)^{2-1} = \$1060$

3<sup>rd</sup> month =  $1000(1.06)^{3-1} = \$1123.60$

b) Plan A:  $1000 + 80(12-1) = \$1880$

Plan B:  $1000(1.06)^{12-1} = \$1898$  (to nearest dollar)

c) (use sum formulas)

i)  $S_{12} = \frac{12}{2}(1000 + 1880) = \$17,280$

ii)  $S_{12} = \frac{1000(1 - 1.06^{12})}{1 - 1.06} = \$16,870$



②  $\begin{cases} b = 24 + (2-1)d \\ c = 24 + (3-1)d \end{cases}$

$c = 24(r)^{2-1} \rightarrow c = 24r \rightarrow \frac{c}{24} = r$

$b = 24(r)^{3-1} \rightarrow b = 24r^2 \rightarrow b = 24\left(\frac{c}{24}\right)^2$

$b = 24 + d \rightarrow d = b - 24$

$b = \frac{c^2}{24}$

$c = 24 + 2d = 24 + 2(b - 24)$

$c = 24 + 2b - 48$

$24b = c^2$

$c = 2b - 24$

$24b = (2b - 24)^2$

$24b = 4b^2 - 96b + 576$

$0 = 4b^2 - 120b + 576$

$0 = 4(b^2 - 30b + 144)$

$0 = 4(b - 24)(b - 6)$

$b = 6, 24$

↑ not possible

$c = 2(6) - 24$

$c = -12$

$$\textcircled{3} \quad u_1 = -2 \quad u_n = 11,998 \quad \text{b) } 11,998 = -2 + (n-1)6$$

$$u_4 = 16$$

$$12,000 = 6n - 6$$

$$12,006 = 6n$$

$$\text{a) } 16 = -2 + (4-1)d$$

$$16 = -2 + 3d$$

$$18 = 3d$$

$$\boxed{6 = d}$$

$$\boxed{2001 = n}$$

$$\textcircled{4} \quad \text{a) } 8^{3^{-1}} = x$$

$$8^{1/3} = x$$

$$\boxed{2 = x}$$

$$\text{b) } (2^3)^{-x} = (2^2)^3$$

$$2^{-3x} = 2^{-6}$$

$$-3x = -6$$

$$\boxed{x = 2}$$

$$\text{c) } \log_{27} x + \log_{27} x = .6$$

$$2 \log_{27} x = .6$$

$$\log_{27} x = .3$$

$$27^{.3} = x$$

$$\boxed{2.69 = x}$$

$$\text{d) } 2^x = 7^{x-1}$$

$$\log_2 7^{x-1} = x$$

$$(x-1)(\log_2 7) = x$$

$$(x-1)(2.81) = x$$

$$2.81x - 2.81 - x = 0$$

$$1.81x = 2.81$$

$$\boxed{x = 1.55}$$

$$\text{e) } \log_9 (81 \cdot \frac{1}{9} \cdot 3) = \log_9 x$$

$$81 \cdot \frac{1}{9} \cdot 3 = x$$

$$\boxed{27 = x}$$

$$\textcircled{5} \quad \text{a) } 2500 = 5000e^{-k(5)}$$

$$.5 = e^{-5k}$$

$$\frac{\ln(.5)}{-5} = \frac{-5k}{-5}$$

$$\boxed{k = .139}$$

$$\text{b) } 50 = 5000e^{-.139t}$$

$$.01 = e^{-.139t}$$

$$\frac{\ln(.01)}{-.139} = \frac{-.139t}{-.139}$$

$$\boxed{t = 33.1 \text{ years}}$$

$$\textcircled{6} \binom{5}{r} (x^3)^{5-r} (-3y^2)^r$$

$$= \binom{5}{r} x^{15-3r} (-3)^r y^{2r}$$

$$15 - 3r = 2r$$

$$15 = 5r$$

$$3 = r$$

$$\binom{5}{3} x^6 (-3)^3 y^6$$

$$\boxed{-270 x^6 y^6}$$

$$\textcircled{7} \binom{5}{r} (3)^{5-r} (-2y)^r$$

$$\binom{5}{3} (3)^2 (-2)^3 y^3 = \boxed{-720 y^3} \quad r=3$$

$$\textcircled{8} a) n+1 = \boxed{10}$$

$$b) \binom{9}{r} (3x^2)^{9-r} \left(\frac{-1}{x}\right)^r$$

$$\binom{9}{r} 3^{9-r} x^{18-2r} \frac{(-1)^r}{x^r} = \underline{\quad} x^0$$

$$\binom{9}{r} 3^{9-r} x^{18-3r} (-1)^r = \underline{\quad} x^0$$

$$18 - 3r = 0$$

$$r = 6$$

$$\binom{9}{6} (3^3) (-1)^6 x^0 = \boxed{2268}$$

$$\textcircled{9} a) (g \circ f)(3) = g(f(3)) \quad f(3) = 2^3 = 8$$

$$= g(8) = \frac{8}{8-2} = \frac{8}{6} = \boxed{\frac{4}{3}}$$

b)  $g^{-1}(5)$  means when does  $g(x) = 5$ ?

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

$$5x - 10 = x$$

$$4x = 10$$

$$x = \frac{10}{4} = \boxed{\frac{5}{2}}$$

- ⑩ a)  $k=3$   
 b)  $p=4$   
 c)  $q=5$

Trig

① a)  $l = (2)(15) = \boxed{30 \text{ cm}}$   
 b)  $A = \frac{1}{2}(2)(15)^2 = \boxed{225 \text{ cm}^2}$

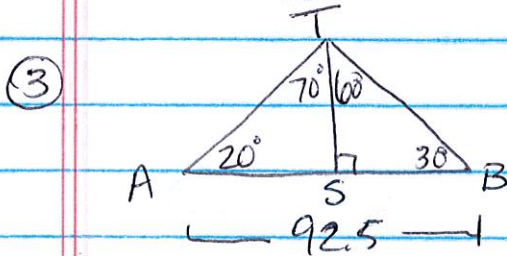
c)  $225 - \frac{1}{2}(15)(15)\sin 2 = \boxed{123 \text{ cm}^2}$  (3 sig figs)

d)  $p = 30 + \overline{AB}$        $(\overline{AB})^2 = 15^2 + 15^2 - 2(15)(15)\cos 2$   
 $\overline{AB} = 25.2$

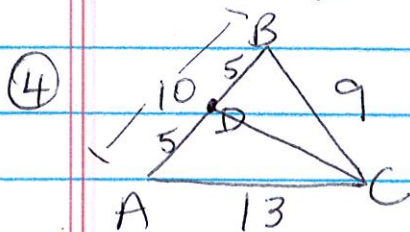
$p = 30 + 25.2 = \boxed{55.2 \text{ cm}}$

②  $\frac{17}{\sin 50^\circ} = \frac{20}{\sin C}$

$C = \boxed{64.3^\circ \text{ or } 116^\circ}$  (3 sig figs)



$\frac{92.5}{\sin 130^\circ} = \frac{TB}{\sin 20^\circ}$        $\sin 30^\circ = \frac{TS}{41.3}$   
 $TB = 41.3^\circ$        $TS = 20.7$



$13^2 = 9^2 + 10^2 - 2(9)(10)\cos B$   
 $B = 86.2^\circ$

$(\overline{CD})^2 = 5^2 + 9^2 - 2(5)(9)\cos 86.2^\circ$   
 $\overline{CD} = 10$