p. 118 # 1-6, p. 119 # 1, 11

1. $r = 25\ km = 25000\ m$
$v = 50.0\ m/s$
$a_c = ?$

$$a_c = \frac{v^2}{r} = \frac{(50.0\ m/s)^2}{25000\ m}$$

$$= 0.10\ m/s^2$$

2. $v = 4.24\ m/s$
$r = 1.2\ m$
$a_c = ?$

$$a_c = \frac{v^2}{r} = \frac{(4.24\ m/s)^2}{1.2\ m}$$

$$= 14.9813\ m/s^2$$
$$= 15\ m/s^2$$

3. $r = 1.4\ m$
$a_c = 12\ m/s^2$
$v = ?$

$$a_c = \frac{v^2}{r} \Rightarrow v = \sqrt{r a_c}$$

$$v = \sqrt{(1.4\ m)(12\ m/s^2)}$$

$$v = 4.09878\ m/s$$
$$= 4.1\ m/s$$

4. $r = 1.08 \times 10^{11}\ m$
$a_c = 1.12 \times 10^{-2}\ m/s^2$
a) $T = ?$

$$a_c = \frac{4\pi^2 r}{T^2} \Rightarrow T^2 = \frac{4\pi^2 r}{a_c}$$

$$T = \sqrt{\frac{4\pi^2 (1.08 \times 10^{11}\ m)}{1.12 \times 10^{-2}\ m/s^2}}$$

$$T = 195111144.03\ s$$
$$= 1.95 \times 10^7\ s$$

b) $T = 195111144.03\ s \times \frac{1\ min}{60\ s} \times \frac{1\ hr}{60\ min} \times \frac{1\ d}{24\ hr} = 226\ days$

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5. $v = 7.27 \times 10^3 \text{ m/s}$
$r = 7.54 \times 10^6 \text{ m}$
$a_c = ?$

$$a_c = \frac{v^2}{r}$$

$$= \frac{(7.27 \times 10^3 \text{ m/s})^2}{7.54 \times 10^6 \text{ m}}$$

$$= 7.01 \text{ m/s}^2$$

6. $a_c = 3.3 \times 10^6 \text{ m/s}^2$
$r = 8.4 \text{ cm} = 8.4 \times 10^{-2} \text{ m}$
a) $f = ?$

$$a_c = 4\pi^2 r f^2 \Rightarrow f^2 = \frac{a_c}{4\pi^2 r}$$

$$f^2 = \frac{3.3 \times 10^6 \text{ m/s}^2}{4\pi^2 (8.4 \times 10^{-2} \text{ m})}$$

$$f = 997.556 \text{ Hz}$$
$$= 1.0 \times 10^3 \text{ Hz}$$

b) $$f = 997.556 \frac{1}{\text{s}} \times \frac{60 \text{ s}}{1 \text{ min}} = 59853.3839 \text{ rpm}$$

$$= 6.0 \times 10^4 \text{ rpm}$$

p. 111 #1 a) changing velocity (direction)

b) $$a_c = \frac{v^2}{r} \quad \times 2r \Rightarrow a_c = \frac{v^2}{2r} = \frac{1}{2}\frac{v^2}{r} \rightarrow \therefore \frac{1}{2}$$

c) $$a_c = \frac{v^2}{r} \quad \times 2v \Rightarrow a_c = \frac{(2v)^2}{r} = 4\frac{v^2}{r} \rightarrow \therefore \times 4$$

11. $a_c = 711 \text{ m/s}^2$
a) $r = 1.21 \text{ m}$
$v = ?$

$$a_c = \frac{v^2}{r} \Rightarrow v = \sqrt{r a_c}$$

$$v = \sqrt{(1.21 \text{ m})(711 \text{ m/s}^2)}$$

$$v = 29.3 \text{ m/s}$$

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b) $29.3\ m/s$ at 42°

x	y
$v_x = 21.77\ m/s$	$v_{y_1} = 19.60\ m/s$
$a_x = 0\ m/s^2$	$a_y = -9.8\ m/s^2$
$d_x = ?$	$d_y = -2.0\ m$
	Δt

1. t, using "y"

$$d = v_1 t + \frac{1}{2} a t^2$$

$$-2.0 = (19.60)t + \frac{1}{2}(-9.8)t^2$$

$$4.9t^2 - 19.60 - 2.0 = 0$$

$$t = \frac{19.60 \pm \sqrt{(19.60)^2 - 4(4.9)(-2.0)}}{2(4.9)}$$

$$t = \frac{19.60 \pm 20.156}{9.8} \qquad t \neq -ve$$

$$t = 4.100\,s$$

2. dx

$$d = v_1 t + \frac{1}{2} a t^2$$
$$d = (21.77)(4.100) + \frac{1}{2}(0)(4.100)^2$$
$$d = 89\ m$$