Physics Midterm

2) Estimations and Unit Analysis

1. $t = 1.5$ s (4.16×10^{-4}) $v = x/t$

    $x = 0.25$km$(1000) = 250$m $v = 2(250/1.5)$

                                                                          $v = 330$ m/s

    C: 330 m/s, 1200 km/hr $v = 2(.25/4.16 \times 10^{-4})$

                                                                          $v = 1200$ km/hr

2. 0.25 m^3

    .25$(100,000) = 250,000$ cm^3

    B: 250,000 cm^3, 28 m/s

3. 100 km/hr

    (100 km/1 hr) x (1000m/1 km) x (1 hr/3600 s) = 27.7 m/s

    B: 28 m/s

4. $D = m/v$

    9 kg $(1000) = 9000$g

    .001 m^3 $(1,000,000$ cm^3/1 m^3$) = 1000$ cm^3

    $D = 9000/1000 = 9$ g cm^-3

    B: 9.0 g cm^-3, copper

3) Vectors

1.

$(10)\text{Cos}(30) = x/10\ (10)$

$X = 8.7 = 5\sqrt{3}i$

$(10)\text{Sin}(30) = x/10\ (10)$

$X = 5j$

<mark>A: $x1 = 5\sqrt{3}i + 5j$</mark>

2.
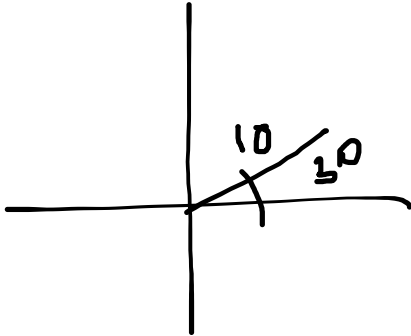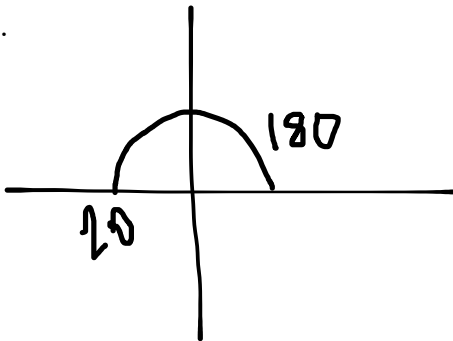
<mark>D: $x1 = -20i$</mark>

3.
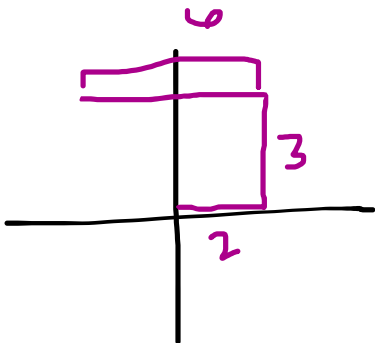
$2-6 = 4$

<mark>A: $x = -4i + 3j$ (km)</mark>

4) Motion Along a Straight Line

1. $x(t) = -2t - 1$ (m)

<mark>D: The particle has a positive, constant velocity</mark>

2. $x(t) = 2t - 1$ (m)

   A: 2 m/s

3. $x(t) = -2t + 7t^2$

$t = 0$	$v = 24 - 0/2 - 0$
$t = 2$	$v = 24/2$
$x(0) = -2(0) + 7(0)^2$	C: 12 m/s
$x(0) = 0$	
$x(2) = -2(2) + 7(2^2)$	
$x(2) = -4 + 28$	
$x(2) = 24$	

4. $a = v/t$ $a = 12/2$

   $v = 12$ m/s $a = 6$ m/s^2

   $t = 2$ sec   D: 7 m/s^2

5. a) $a = 5.0$ m/s^2 $a = v/t$

   $v = 10$ m/s $t = v/a = 10/5 = 2$

                                        B: 2 seconds

   b) $v = x/t$ $x = 10\ (2)$

      $x = v(t)$ $x = 20$ m

                                          D: 20 meters

   c) $v = x/t$ $t = 100/10$

   $t = x/v$ $t = 10$ s

                        B: 10 seconds

5) Motion in Two and Three Dimensions

1. $x = 75$ m   WAT

   $j = 162.5$ <mark>B: 13 m/s</mark>

2. theta$= 45$ $R = 40^2 \sin (2(45))/ 9.81$

   $v = 40$ m/s $R = 1600 (1) / 9.81$

   $R = v^2 \sin (2 \text{ theta})/g$ $R = 163.1$

                              <mark>C: 160 m</mark>

3. $T = 2 v \sin(\text{theta})/g$

   $T = 2 (40) \sin (45) / 9.81$

   $T = 5.5$ seconds

   <mark>B: 5.5 seconds</mark>

6) Forces

1. $m = 250$ g $(.25$ kg$)$

   change in $x = 68-48 = 20$ cm $= .2$ m

   $k = -F / x$ $k = -2.45/.2$

   $F = mg$ $k = 12$

   $F = .25 (9.81) = 2.45$ <mark>D: 12 N/m</mark>

   $x = .2$

2. Fnet = ma

a = NF – Friction /m   a = 75 – (75-7.5) / 75

a = 67.5 / 75

a = .9

B: 1 m/s^2

3. An example of a substance that could be added to the floor that would boost the

acceleration is something like grease/oil.