

Math 124 Practice Test Chapters 3 & 4
Solutions

1. §3.1 Convert each radian measure to degrees.

(a) $\pi/3$

$$\frac{\pi}{3} = \frac{\pi}{3} \cdot \frac{180^\circ}{\pi} = 60^\circ$$

(b) $\frac{7\pi}{4}$

$$\frac{7\pi}{4} = \frac{7\pi}{4} \cdot \frac{180^\circ}{\pi} = 315^\circ$$

2. §3.1 Convert each degree measure to radians.

(a) 120°

$$120^\circ = 120^\circ \cdot \frac{\pi}{180^\circ} = \frac{2\pi}{3}$$

(b) 300°

$$300^\circ = 300^\circ \cdot \frac{\pi}{180^\circ} = \frac{5\pi}{3}$$

3. §3.1 Find the exact value of each expression.

(a) $\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$

(b) $\cos \frac{5\pi}{6} = -\frac{\sqrt{3}}{2}$

(c) $\tan \frac{7\pi}{6} = \frac{\sqrt{3}}{3}$

(d) $\sin \frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$

FORMULAS:

- Arc length $s = r\theta$
- Linear velocity $v = \frac{s}{t}$
- Angular Velocity $\omega = \frac{\theta}{t}$
- $v = r\omega$

FACTS: 5280 ft = 1 mi

4. §3.2 Find the length to three significant digits of the arc intercepted by a central angle $\theta = 2\pi/3$ in a circle of radius $r = 12.3$ feet.

$$s = r\theta = (12.3) \left(\frac{2\pi}{3} \right) = 8\pi \approx 25.1$$

5. §3.4 The tires of a bicycle have radius 13 inches and are turning at the rate of 215 revolutions per minute. How fast is the bicycle traveling in miles per hour?

$$r = (13 \text{ in}) \cdot \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \cdot \left(\frac{1 \text{ mi}}{5280 \text{ ft}} \right)$$

$$\omega = \left(\frac{215 \text{ rev}}{1 \text{ min}} \right) \cdot \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) \cdot \left(\frac{60 \text{ min}}{1 \text{ hr}} \right) = 25800\pi \text{ rad/hr}$$

$$v = r\omega = \left(\frac{13}{(12)(5280)} \text{ mi/rad} \right) \cdot (25800\pi \text{ rad/hr}) \approx 16. \text{ mi/hr}$$

6. §3.4 Mars rotates on its axis at the rate of about .2252 radian per hr. Approximately how many hours are in a Martial day (or sol)?

$$1 \text{ sol} = \left(\frac{1 \text{ hr}}{0.2252 \text{ rad}} \right) \cdot \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) \approx 27.9\text{hr}$$

Note: There is a typo in the original rate of .2252 radians per hour.

7. §3.4 Find v , the linear velocity, of the tip on an airplane propeller 3 meters long, rotating 500 times per minute. (Hint: $r = 1.5$ m)

$$r = 1.5 \text{ m,}$$

$$\omega = \left(\frac{500 \text{ rev}}{1 \text{ min}} \right) \cdot \left(\frac{2\pi \text{ rad}}{1 \text{ rev}} \right) = 1000\pi \text{ rad/min}$$

$$v = r\omega = (1.5 \text{ m/rad}) \cdot (1000\pi \text{ rad/min}) = 1500\pi \text{ m/min}$$

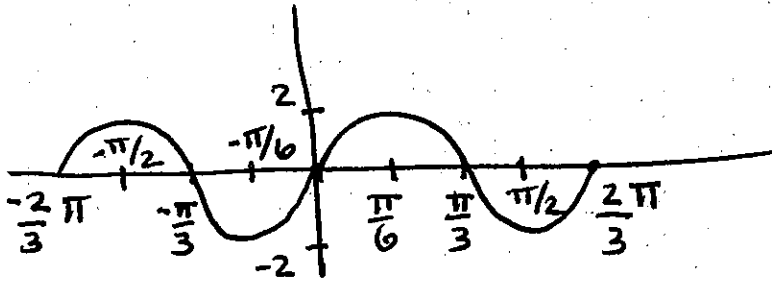
§4.1, 4.2, 4.3, 4.4 Sketch the graph of the function over a two-period interval. Give the period, amplitude, and phase shift. Label quarter periods along the x -axis.

8. $y = 2 \sin 3x$

$P = \frac{2\pi}{3}$

$A = 2$

phase shift: none

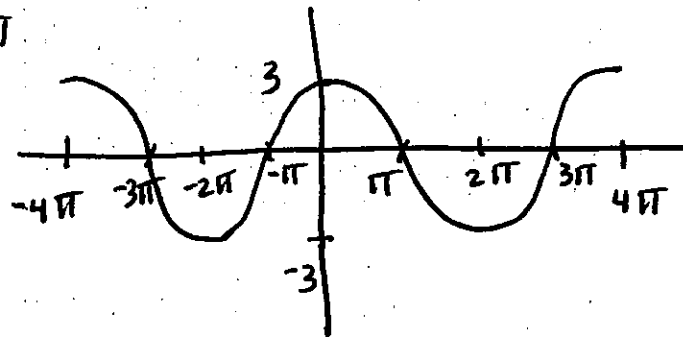


9. $y = 3 \cos \frac{1}{2}x$

$P = \frac{2\pi}{1/2} = 2\pi \cdot \frac{2}{1} = 4\pi$

$A = 3$

No phase shift



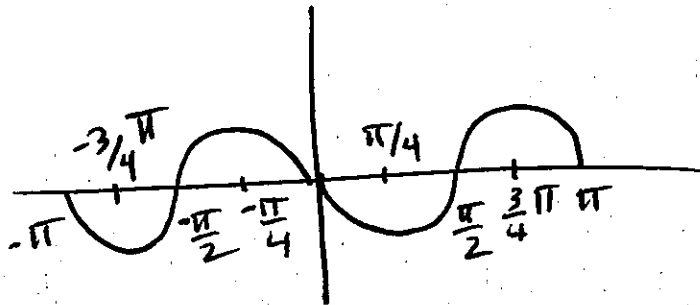
10. $y = -\sin 2x$

$P = \frac{2\pi}{2} = \pi$

$A = 1$

no phase shift

reflect about x-axis



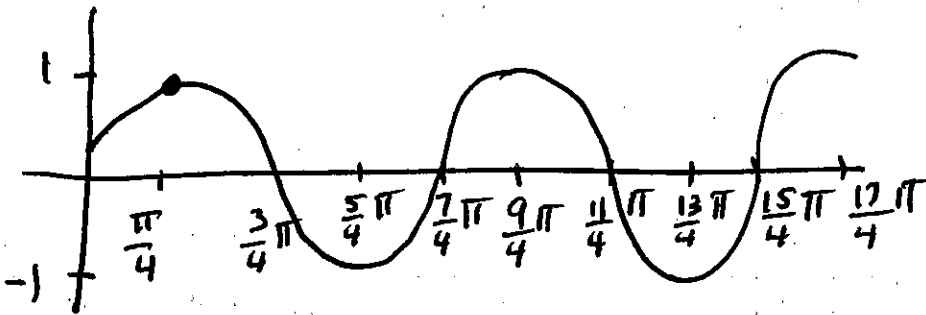
11. $y = \cos(x - \pi/4)$

$P = 2\pi$

$A = 1$

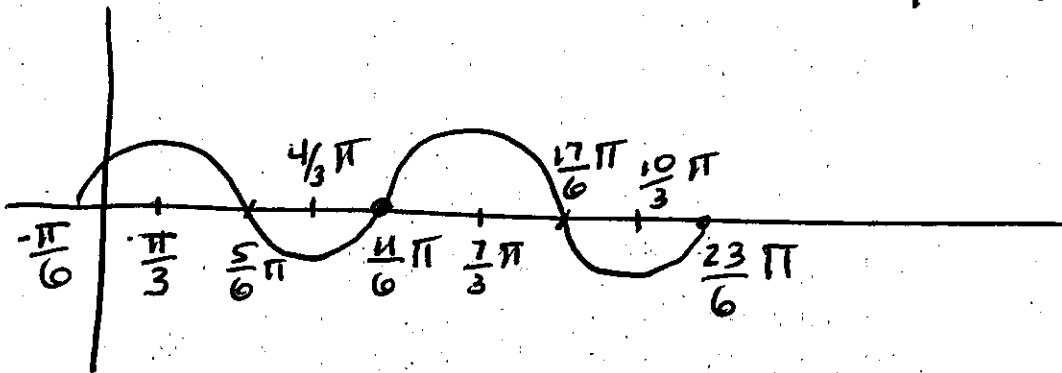
phase shift $\frac{\pi}{4}$ right

Qtr Per = $P/4 = \frac{2\pi}{4} = \frac{\pi}{2}$



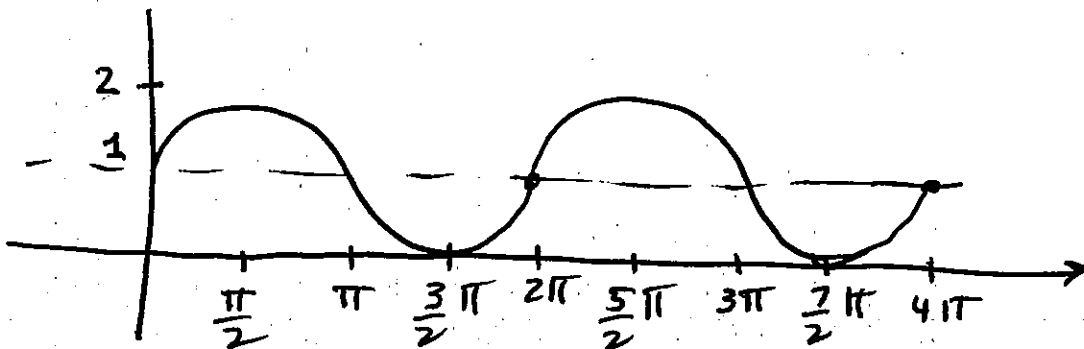
12. $y = \sin(x + \pi/6)$

$A=1, P=2\pi$
 phase shift $\pi/6$ left
 Qtr Per = $\frac{2\pi}{4} = \frac{\pi}{2} = \frac{3\pi}{6}$



13. $y = 1 + \sin x$

$A=1, P=2\pi$, no phase shift.
 shift up by 1



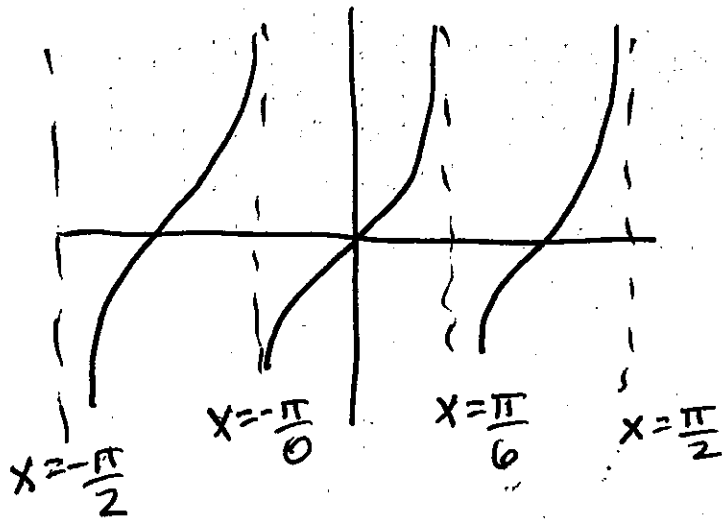
14. $\tan 3x$

$P = \frac{\pi}{3}$, no phase shift

one cycle

$$-\frac{\pi}{2} < 3x < \frac{\pi}{2}$$

$$-\frac{\pi}{6} < x < \frac{\pi}{6}$$



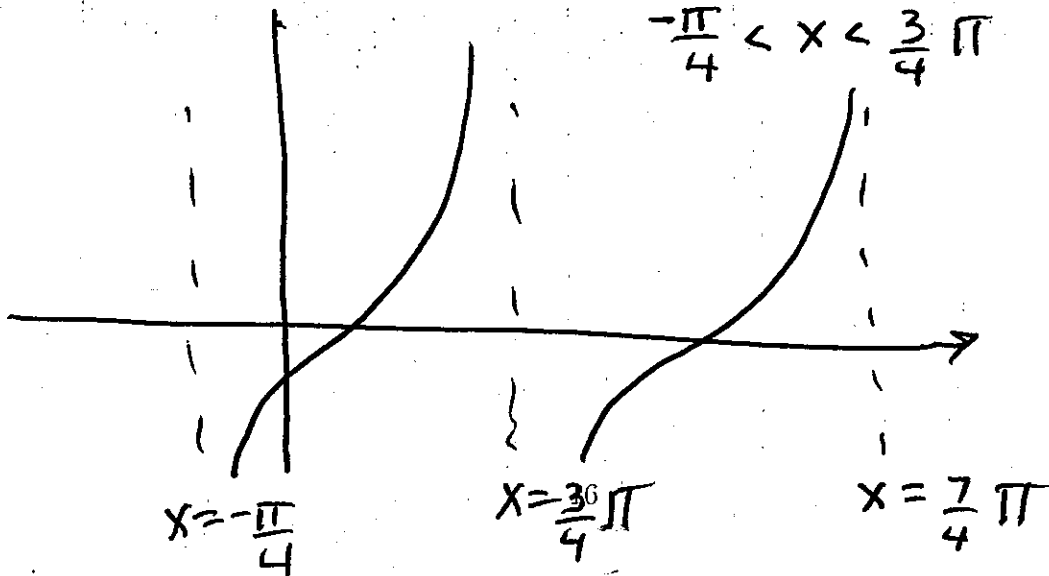
15. $\tan(x - \pi/4)$

$P = \pi$, phase shift $\frac{\pi}{4}$ right.

One cycle

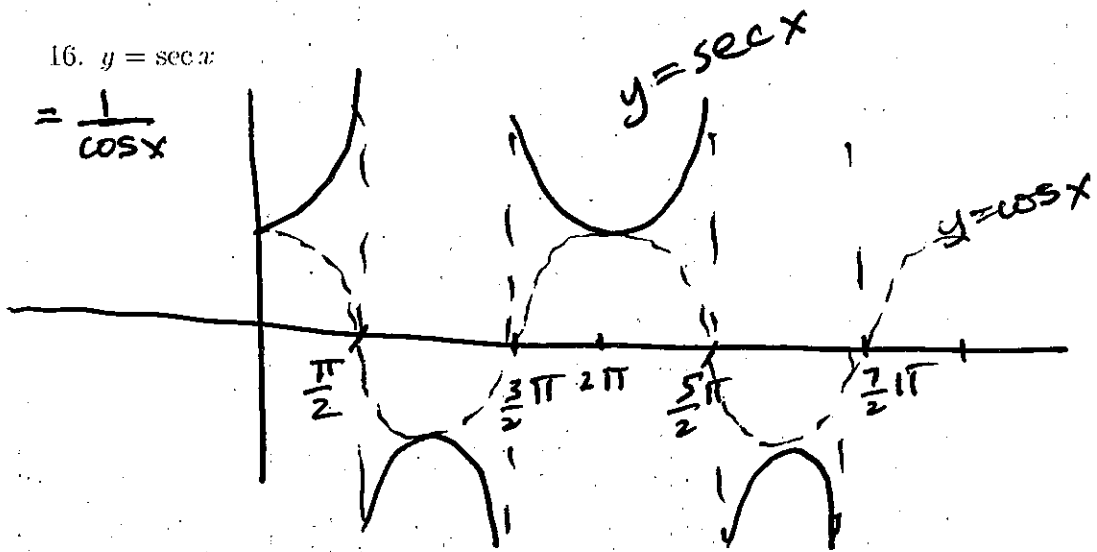
$$-\frac{\pi}{2} < x - \frac{\pi}{4} < \frac{\pi}{2}$$

$$-\frac{\pi}{4} < x < \frac{3\pi}{4}$$



16. $y = \sec x$

$= \frac{1}{\cos x}$



17. $y = \csc x$

$= \frac{1}{\sin x}$

